JOURNAL
OF THE
ARNOLD ARBORETUM

VOL. XVIII | OCTOBER, 1937 | NUMBER 4

THE STRUCTURAL VARIABILITY OF THE SECONDARY WALL AS REVEALED BY "LIGNIN" RESIDUES

I. W. BAILEY
and
THOMAS KERR[1]

With plates 211–214

INTRODUCTION

WE HAVE SHOWN in previous papers (1, 10) that the cellulosic matrix of the secondary wall is composed of a continuous and firmly coherent system of anastomosing fibrils which grade down to 0.1 μ or less in diameter. The diverse structural patterns of the secondary wall are due, primarily, to variations in the size, number, and arrangement of these anastomosing fibrils. Layers of conspicuously different optical anisotropy — i.e., in transverse or longitudinal sections of a wall — are commonly due to different orientations of the threadlike aggregations of chain molecules of cellulose in successively formed parts of the secondary wall. Lamellae of varying porosity or density are due to fluctuations particularly in the number of fibrils per unit area. In other words, the fibrils are loosely aggregated in the more porous lamellae and are closely compacted in the denser lamellae.

Lignin and other non-cellulosic substances may be deposited in the elongated, intercommunicating interstices of the cellulosic matrix, thus giving rise to two continuous, interpenetrating systems of different chemical composition. In the case of certain heavily "lignified" tissues and in cotton of the "green lint" variety, it is possible, as we have shown (1, 10), to dissolve either system without seriously modifying the con-

[1]Parts of these investigations were made by the junior author as a National Research Council Fellow in Botany.

tinuity or the structural pattern of the remaining system. Therefore, in the case of such cells, there are three methods of studying the structural patterns of the secondary wall: (1) by direct observation of chemically untreated sections; (2) by removing the non-cellulosic constituents and carefully swelling the purified cellulose; and (3) by dissolving the cellulose with concomitant swelling of the non-cellulosic residue. The structural residues obtained by the last two methods are remarkably similar, the denser parts of one corresponding to the more porous parts of the other. Thus, the structural pattern of the cellulose may be reconstructed from the non-cellulosic residue and *vice versa*. Swollen sections of the purified cellulose afford excellent objects for critical visual examination, but "lignin" residues are easier to prepare, and are preferable for photomicrography in dealing with lignified tissues, e.g., wood.

TYPES OF LIGNIFICATION AND OF RESIDUES OBTAINED BY TREATMENT WITH 72% SULPHURIC ACID

In 1903, De Lamarlière (11) published the results of an extended investigation of Mäule's (12) test[1] for lignification. He demonstrated that the lignified tissues of the vascular cryptogams and gymnosperms, exclusive of the Gnetales, give a brown coloration with this test, whereas the lignified tissues of the angiosperms give the typical violet-red color. De Lamarlière's distinction between the behavior of the lignified tissues of the Gnetales and angiosperms, on the one hand, and of the remaining representatives of the vascular plants, on the other hand, has been confirmed by Schorger (16), Crocker (4), Sharma (17), and Schindler (15). Crocker (5) emphasized the fact, however, that certain samples of the wood of *Podocarpus amara* Bl. give a positive red coloration with the Mäule test, and Casparis (3) noted that the lignified vessels of the dicotyledonous *Aconitum Napellus* L. yield a negative brown color.

As early as 1849, Payen (13), in reporting upon the work of Vincent, called attention to the fact that the lignified fibers of certain angiosperms turn red when treated successively with chlorine and ammonia. Bevan and Cross (2) found that the yellow color of chlorinated jute fibers turns to a brilliant magenta in hot sodium sulphite, and subsequently showed (6) that chlorinated dicotyledonous woods exhibit this striking change in coloration, whereas chlorinated coniferous woods do not. Crocker (4), Harlow (7), and others are of the opinion that the chlorine-sodium sulphite reaction is essentially a Mäule test, since chlorine water may be

[1]In a positive Mäule test, a violet-red color develops when lignified tissue is treated for five minutes in a 1 per cent solution of potassium permanganate, washed, treated with dilute hydrochloric acid, washed, and then subjected to the action of ammonia.

substituted for potassium permanganate-HCl, and sodium sulphite and other alkalis for ammonia, in the Mäule test. We have found, in our extensive surveys of many gymnosperms and angiosperms, that the chlorine-sodium sulphite and Mäule tests are quite interchangeable and yield parallel and concordant results.

The woods of the conifers do not exhibit positive colorations with either of these tests, but give intense red colorations with phloroglucinol and hydrochloric acid. Furthermore, as shown by Harlow (7), the secondary walls of the tracheids do not disintegrate upon treatment with 72% sulphuric acid. In the case of *Podocarpus amara,* which is an exception to this general rule, the parts of the secondary walls which give an intense, positive, violet-red color with the Mäule test, exhibit a feeble coloration with phloroglucinol-HCl, and tend to disintegrate upon treatment with strong mineral acids, leaving a finely granular residue of insoluble material. Conversely, the parts which give a strong coloration with phloroglucinol-HCl exhibit a feeble or negative reaction with the Mäule test and persist, upon treatment with 72% sulphuric acid or 41% hydrochloric acid, as coherent structural residues.

Macroscopically, the lignified woods of most dicotyledons exhibit a positive Mäule test, as De Lamarlière and others have shown, although the intensity of the violet-red color varies greatly from specimen to specimen. *Microscopically,* specific categories of the constituent cells may behave quite differently from the tissue as a whole. Thus, the walls of the vessels or parenchymatous cells frequently give an intense coloration with phloroglucinol-HCl, a negative or relatively feeble Mäule reaction, and coherent structural residues, upon treatment with 72% sulphuric acid; whereas the secondary walls of the fiber-tracheids or libriform fibers exhibit an intense violet-red color with the Mäule test and disintegrate upon treatment with strong mineral acids. Conversely, the walls of the wood fibers may give an intense coloration with phloroglucinol-HCl, a feeble or negative Mäule reaction, and coherent structural residues, whereas the secondary walls of the parenchymatous cells may exhibit a strongly positive Mäule test and disintegrate into a finely granular residue of insoluble material. Similarly, the central layers of the secondary wall may give an intense Mäule test and disintegrate upon treatment with 72% sulphuric acid when the inner and outer layers do not, and *vice versa.*

It is significant that, in the case of both gymnosperms and angiosperms, walls or layers which persist as coherent structural residues, when the cellulose is dissolved, usually give a very intense red coloration with phloroglucinol-HCl; whereas those which disintegrate commonly do

not, although they may give a strong positive coloration with either the Mäule test or the chlorine-sodium sulphite reaction. In other words, the available cumulative circumstantial evidence suggests that, in general, lignified secondary walls, which persist as coherent structural residues upon treatment with strong mineral acids, contain a relatively high ratio of associated aromatic aldehyde. Where the walls exhibit an intense coloration with the Mäule test, but disintegrate upon treatment with 72% sulphuric acid, it is possible to obtain coherent structural residues by first soaking the sections in a solution of vanillin.

There are, however, a number of complicating factors which must be considered in dealing with these color reactions and with residues remaining after treatment with strong mineral acids. Many woods, particularly heartwoods, contain substances which seriously interfere with, or even inhibit, the color tests, and many of them are saturated with substances, other than lignin, that are insoluble in 72% sulphuric acid. Generally, if the sapwood of a species produces a granular residue after treatment with 72% sulphuric acid, the presence of heartwood substances will not change the residue into a coherent structure, but it is probable that certain of the apparent exceptions to the correlations that have been outlined in preceding paragraphs may be due to such complicating factors as these.

It should be emphasized, in this connection, that in studying the structural patterns of the secondary wall, it is immaterial whether the interstices of the cellulosic matrix are filled with lignin or with a mixture of substances that are insoluble in 72% sulphuric acid. It is essential merely that the non-cellulosic constituents persist as a coherent residue which is capable of swelling without excessive distortion of the original structural pattern. For convenience, we shall refer to the insoluble parts of the wall as "lignin" residues, regardless of their exact chemical composition.

In dealing with most coniferous woods, it is possible to obtain adequate preparations by treating sections directly with 72% sulphuric acid. In the case of dicotyledonous woods, there are three types of cell walls or walls layers, — (1) those which give coherent structural residues upon treatment with strong mineral acids; (2) those which distintegrate into a finely granular residue unless they are given pretreatments with vanillin or some equivalent reagent; and (3) unlignified or lightly lignified walls and layers which distintegrate even when given prolonged pretreatments, and whose structural patterns should be obtained from the cellulosic matrix. Certain tropical dicotyledons give uniformly coherent lignin residues, but the secondary walls of fiber tracheids and

libriform fibers in most temperate species disintegrate into a finely granular mass after the action of 72% sulphuric acid.

STRUCTURAL VARIABILITY OF THE SECONDARY WALL WITHIN DIFFERENT PARTS OF THE SAME STEM

In a previous paper (1), we discussed the principal types of structural patterns that occur within the secondary walls of tracheary cells and fibers. The broad central layers of thick secondary walls exhibit a number of different patterns that are due, primarily, to varying porosities of the cellulosic matrix. Thus, there are (1) layers which have a prevailing concentric (*Fig. 3*) structure throughout; (2) layers which have a dominantly radial (*Fig. 2*) pattern; and (3) others which exhibit various complex, intermediate, or radio-concentric (*Fig. 6*) structures. In addition, the central layer of the secondary wall not infrequently has conspicuous broad zones (*Figs. 1, 8,* and *12*) which are due largely to variations in the amount of non-cellulosic material that is deposited in the interstices of successively formed parts of the wall. These zones may or may not be correlated with changes in the structural pattern or in the porosity of the cellulosic matrix.

It is of considerable interest to determine whether specific structural patterns are characteristic of particular species, or whether they fluctuate in different parts of the same individual. In order to test this point, we have examined sections of xylem from different parts of the stems of various dicotyledons from both temperate and tropical habitats. In no case have we encountered a species in which the structural patterns of the secondary walls of the tracheids, fiber-tracheids, or libriform fibers are constant throughout different parts of the same plant. On the contrary, the patterns tend to fluctuate considerably from one part of the plant to another. Not infrequently, one may encounter all transitions from prevailingly concentric to dominantly radial structural patterns within different cells of the same stem.

Figs. 3–7 illustrate various structural patterns in the secondary walls of fiber-tracheids from different parts of the stem of *Poraqueiba sericea* Tul. The structure in *Fig. 3* is prevailingly concentric, and the alternating more porous and less porous lamellae are numerous and narrow. The lamellae are wider and less numerous in *Figs. 4* and *7;* and the wall, as a whole, exhibits, in addition to the obvious concentricities, a finely radial structure that is close to the limits of microscopic visibility. In *Fig. 6,* the secondary wall has a combined radio-concentric structure throughout; whereas in *Fig. 5* there is an abrupt transition from a radio-concentric to a dominantly radial structure, in passing from the first formed to the subsequently formed part of the wall.

Figs. 8 and *10–13* illustrate fluctuations in the structural patterns of fiber-tracheids from different parts of the stem of *Siparuna bifida* (P. & E.) A. DC. *Fig. 8* shows a radio-concentric pattern of extremely fine texture; and *Fig. 12,* a similar radio-concentric pattern of coarser texture. The broad dark-colored zones are due, in both cases, to more intense "lignification" rather than to marked variations in the porosity of the original cellulosic matrix. In *Fig. 10,* there is a gradual transition from radio-concentric to coarsely radial structure, in passing from the first-formed to the last-formed parts of the wall. In *Fig. 11,* as in *Fig. 5,* the transition is abrupt. In *Fig. 13,* most of the wall has a prevailingly and conspicuously radial structure.

It is evident, accordingly, that not only may the structural pattern of the secondary wall vary greatly in different cells of the same tissue, but also in different parts of the same wall. The fluctuations are, in general, of two distinct kinds: (1) those which involve changes in the type of structural pattern, e.g., from radial to concentric or *vice versa;* and (2) those which involve merely a change in texture, e.g., from finely to coarsely radial or *vice versa.*

One of us (10) has shown that, in the case of the secondary wall of the cotton hair, each of the daily growth rings consists of two parts, a more porous and a less porous lamella. The porosity and width of the successively formed lamellae appear to be correlated with variations in environmental factors. It seems probable that many of the concentricities in the secondary walls of wood fibers may similarly be correlated, either directly or indirectly, with fluctuations in environmental factors; since cells which developed simultaneously not infrequently exhibit identical variations in their sequences of lamellae.

Although the cytological and physiological factors which lead to the formation of a radially lamellated secondary wall are at present entirely obscure, there are certain data available which are of considerable interest in any discussion of radial structural patterns.

In the case of the Coniferae, as Hartig (8) and others have shown, the peculiar tracheids of the so-called compression wood, or Rotholz, have an anomalous type of secondary wall, the broad inner part of which is composed of coarse, radio-helically oriented plates. These plates are separated laterally by corresponding radio-helical discontinuities in the cellulosic matrix, *Fig. 16.* Furthermore, the broad inner layer is separated from the narrow first-formed layer of the secondary wall by an isotropic layer of non-cellulosic composition. On the contrary, the secondary wall of normal coniferous tracheids is composed of narrow inner and outer layers, and a central layer of varying width which is

characterized by having a finely concentric structure (*Fig. 14*), i.e., alternating more porous and less porous lamellae, such as occur in the cotton hair. There are no actual discontinuities in the cellulosic matrix, and the three layers of the secondary wall are due to varying orientations of the cellulose in the successively formed parts of the wall.

Rotholz is formed, apparently, in response to geotropic stimuli, and in nature is distributed largely in those parts of the stem and branches which are subjected to compression. Thus, it develops upon the under side of branches and of bent or inclined stems, and also in stems of erect trees which are subjected to forces, — e.g., prevailing winds or asymmetrical crowns — that tend to deflect the stem from a truly vertical position. That the formation of Rotholz is not due, however, to compression of the tissues may be demonstrated by bending horizontal branches. The Rotholz forms in the under side of such branches, regardless of whether the tissues are under tension or compression.

It should be emphasized, in this connection, that Rotholz is more commonly and widely distributed in the large stems of apparently erect coniferous trees than is generally recognized. Furthermore, depending upon variations in the intensity of the geotropic stimuli, one encounters, particularly in the latewood of the annual growth layers, all gradations of transitional or intermediate structures between typical Rotholz tracheids and normal 3-layered tracheids. The secondary walls of such intermediate cells may have complex combinations of both concentric and radial patterns. Where the intensity of the geotropic stimulus is reduced, but is still dominant, the broad inner layer of the secondary wall may exhibit a prevailingly and finely radial pattern (*Fig. 15*) which is devoid of actual discontinuities in the cellulosic matrix. Although this broad inner layer is composed, throughout, of a continuous system of anastomosing fibrils, it tends to develop radio-longitudinal cracks in drying, a phenomenon which has led to a number of misleading generalizations concerning the structure of normal coniferous tracheids.

In view of such facts as these, it is evident that, in tracheids which are developing under the influence of geotropic stimuli, the apposition of cellulose varies in different radio-helical planes, resulting in the formation of alternating radio-helical lamellae of varying porosity. Where the geotropic stimuli are at a maximum, no cellulose is deposited in certain of the radio-helical planes, and the inner part of the wall is composed of separate radio-helical plates (*Fig. 16*). On the contrary, in normal coniferous tracheids, the apposition of cellulose is relatively uniform in any particular circumference (*Fig. 14*), but fluctuates during successive stages of wall formation, thus giving rise to concentric lamellae of vary-

ing porosity. Where both the normal and the geotropic influences are operative within the same cell, both types of apposition may occur simultaneously, resulting in various complex radio-concentric patterns.

In the case of the dicotyledons, the secondary walls of the fiber-tracheids and libriform fibers not infrequently form layers which have been referred to as "gelatinous" or "mucilaginous." These layers were differentiated by Sanio (14) and other early investigators by their peculiar optical properties and by their violet coloration in chloro-iodide of zinc. Sanio noted that they vary in number, width, and position even in walls of adjacent cells of the same tissue, and that they may be lignified or unlignified. The unlignified gelatinous layers are extremely hygroscopic, undergo striking changes in volume during drying and tend to develop radio-helical or radio-longitudinal cracks. They also are characterized by the fact that they stain intensely in ruthenium red and in Haidenhain's haematoxylin and other basic dyes.

That such layers are not composed largely of pectinaceous, gummy, or mucilaginous substances or of hemicelluloses, but rather of alpha-cellulose, may be demonstrated by a study of their chemical solubilities. Nor do they necessarily contain a much higher ratio of polyuronides than normal secondary walls, since they do not yield higher ratios of carbon dioxide upon hydrolysis with dilute hydrochloric acid. It is a question, therefore, whether the putative physical peculiarities and the staining reactions of these so-called gelatinous layers are due to the presence of non-cellulosic constituents or to purely physical peculiarities of the cellulosic matrix. In all the typical "gelatinous" layers that we have examined, the cellulosic matrix is of relatively coarse texture and exhibits a conspicuously radial (*Fig. 2*) or radio-concentric structure. Where there is a single so-called gelatinous layer, it may form the bulk of the secondary wall and abut directly upon the first-formed narrow layer, or it may form a broad inner layer (*Fig. 2*) or a central layer of varying width. It usually is separated from the more normal layers of the secondary wall by discontinuities in the cellulose which are filled with isotropic substances. Where there are several successively formed gelatinous layers, they tend to be separated by similar discontinuities, i.e., by tenuous layers of isotropic material. We have found in a survey of the woods of a large number of dicotyledons that the so-called gelatinous layers are not always more lightly lignified than the normal layers. In many cases, especially in certain tropical species (*Fig. 2*) the reverse is true, i.e. the "gelatinous" layers form coherent residues upon treatment with 72% sulphuric acid, whereas the normal layers disintegrate.

Jaccard (9) and others have shown that, in the strongly epinastic

branches of various dicotyledonous trees, the wood fibers in the upper side of the branch tend to be of the gelatinous-layered type, whereas those in the under side of the branch are of normal structure. Although the distribution of the two cell types is less diagrammatic and regular in the epinastic stems and branches of dicotyledons than is that of the two types of tracheids in the hyponastic stems and branches of conifers, the available evidence suggests that "gelatinous" layers are formed in parts of dicotyledonous stems and branches which are developing under the influence of intense geotropic or phototropic stimuli. It seems likely, therefore, that in many dicotyledons, as in the conifers, wall layers having dominantly radial structural patterns develop under the influence of tropistic stimuli. It must be admitted, however, that much additional work remains to be done upon dicotyledons, in order to determine (1) whether all normal fiber-tracheids and libriform fibers have a concentric structural pattern and (2) whether tropistic stimuli of varying intensities are actually concerned in the development of such complex radio-concentric patterns as are illustrated in *Figs. 5, 6, 10–13.*

CONCLUSIONS

1. In the wood of both gymnosperms and angiosperms, walls or layers which persist as coherent structural residues upon treatment with strong mineral acids usually give an intense coloration with phloroglucin-HCl; whereas those which disintegrate commonly do not, although they may give a strongly positive coloration with either the Mäule test or the chlorine-sodium sulphite reaction.

2. Where the walls exhibit an intense coloration with the Mäule test, but tend to disintegrate into a finely granular residue upon treatment with 72% sulphuric acid, it is possible to obtain coherent structural residues by first soaking sections in a solution of vanillin or some equivalent reagent.

3. The structural patterns of the secondary walls of tracheids, fiber-tracheids, and libriform fibers are not constant for any particular species, but fluctuate more or less in different parts of the same stem and even, at times, of the same cell.

4. Prevailingly concentric, dominantly radial, and various intermediate radio-concentric, structures occur in different parts of the stems of conifers and of many dicotyledons.

5. In the case of coniferous tracheids, radial structural patterns are formed in parts of the stem and branches which are developing under the influence of geotropic stimuli.

6. The so-called gelatinous fibers of dicotyledonous woods have a conspicuously radial or radio-concentric structure. There is some evidence to indicate that these fibers occur in parts of stems and branches that are developing under the influence of tropistic stimuli.

7. Much additional work remains to be done upon dicotyledons, in order to determine whether all normal fiber-tracheids and libriform fibers have a prevailingly concentric structure, and whether all radial and radio-concentric structures of the secondary wall are due to tropistic stimuli.

LITERATURE CITED

1. BAILEY, I. W. and T. KERR. The visible structure of the secondary wall and its significance in physical and chemical investigations of tracheary cells and fibers. (Jour. Arnold Arb. **16**: 273–300. 1935.)
2. BEVAN, E. J. and C. F. CROSS. Contributions to the chemistry of bast fibers. (Chem. News, **42**: 77–80. 1880.)
3. CASPARIS, P. Beiträge zur Kenntnis verholzter Zellmembranen. (Pharm. Monatshefte, **1**: 121–129; 137–146; 153–160. 1920.)
4. CROCKER, E. C. An experimental study of the significance of "lignin" color reactions. (Ind. Eng. Chem. **13**: 625–632. 1921.)
5. ——— Mäule lignin test on Podocarpus wood. (Bot. Gaz. **95**: 168–169. 1933.)
6. CROSS, C. F. and E. J. BEVAN. Cellulose. Longmans, Green & Co. London. 1910.
7. HARLOW, W. H. Contributions to the chemistry of the plant cell wall. II. Lignification in the secondary and tertiary layers of the cell walls of wood. (Tech. Pub. N. Y. State Coll. Forestry. No. **24**. 1928.)
8. HARTIG, R. Holzuntersuchungen. Julius Springer. Berlin. 1901.
9. JACCARD, P. Bois de tension et bois de compression dans les branches dorsiventrales des "feuillus." (Rev. Gén. Bot. **29**: 225–243. 1917.)
10. KERR, T. The structure of the growth rings in the secondary wall of the cotton hair. (Protoplasma, **27**: 229–241. 1937.)
11. LAMARLIÈRE, L. G. DE. Recherches sur quelques réactions des membranes lignifiées. (Rev. Gén. Bot. **15**: 149–159; 221–234. 1903.)
12. MÄULE, C. Das Verhalten verholzter Membranen gegen Kaliumpermanganat, eine Holzreaktion neuer Art. (Beitr. Wiss. Bot. **4**: 166–185. 1901.)
13. PAYEN, A. Chimie appliquée. Rapport sur les moyens proposés par M. Vincent, pharmacien en chef de la marine, pour distinguer les fibres textiles des diverses plantes. (Compt. Rend. Acad. Sci. Paris, **29**: 491–495. 1849.)
14. SANIO, C. Vergleichende Untersuchungen über die Elementarorgane des Holzkörpers. (Bot. Zeit. **21**: 85–91; 93–98; 99–111; 113–118; 121–128. 1863.)
15. SCHINDLER, H. Kritische Beiträge zur Kenntnis der sogenannten Holzreaktionen. (Zeitschr. Wiss. Mikroskopie, **48**: 289–319. 1931.)
16. SCHORGER, A. W. The chemistry of woods. (Ind. Eng. Chem. **9**: 561–566. 1917.)
17. SHARMA, P. D. The Mäule reaction as a means of distinguishing between the wood of angiosperms and gymnosperms. (Jour. Forestry, **2**: 476–478. 1922.)

DESCRIPTION OF PLATES

Plate 211

Fig. 1. *Tetramerista glabra* Miq. Transverse section of a fiber-tracheid, mounted in a dilute solution of iodine-potassium iodide, and photographed with a Zeiss 70-water-immersion lens. The secondary wall exhibits broad dark and light zones correlated with varying intensities of lignification. × 2000

Fig. 2. *Rhizophora Mangle* L. Transverse section of a libriform fiber, stained with safranin and Haidenhain's haematoxylin. The heavily lignified, broad inner "gelatinous" layer of the secondary wall has a coarsely radial structural pattern. × 3000.

Plate 212

Fig. 3. *Poraqueiba sericea* Tul. Transverse section of a fiber-tracheid after treatment with vanillin and 72% sulphuric acid, showing narrow concentric growth rings of the secondary wall. × 800.

Fig. 4. *The same.* Showing wider growth rings. × 800.

Fig. 5. *The same.* Showing abrupt transitions from radio-concentric to prevailingly radial structure. × 800.

Fig. 6. *The same.* Showing radio-concentric structural pattern. × 800.

Fig. 7. *The same.* Showing relatively broad concentric growth rings. × 800.

Plate 213

Fig. 8. *Siparuna bifida* (P. & E.) A. DC. Transverse section of a fiber-tracheid after treatment with 72% sulphuric acid, staining with Haidenhain's haematoxylin, and mounting in aniline oil; showing radio-concentric structure and broad light and dark zones correlated with varying intensities of lignification. × 800.

Fig. 9. *Lophopetalum* species. Transverse section of a libriform fiber after treatment with phloroglucinol and hydrochloric acid, followed by 72% sulphuric acid, staining with Haidenhain's haematoxylin, and mounting in balsam; showing residue of the more heavily lignified zones of the secondary wall. × 800. Compare *Fig. 1.*

Fig. 10. *Siparuna bifida.* Transverse section of a fiber-tracheid after treatment with 72% sulphuric acid, staining with Haidenhain's haematoxylin, and mounting in aniline oil; showing transition from finely reticulate to prevailingly radial structural pattern. × 800.

Fig. 11. *The same.* Showing abrupt transition from radio-concentric to radial structural pattern. × 800.

Fig. 12. *The same.* Showing finely reticulate structure and broad zones of varying intensities of lignification. × 800.

Fig. 13. *The same.* Showing strikingly radial structural pattern. × 800.

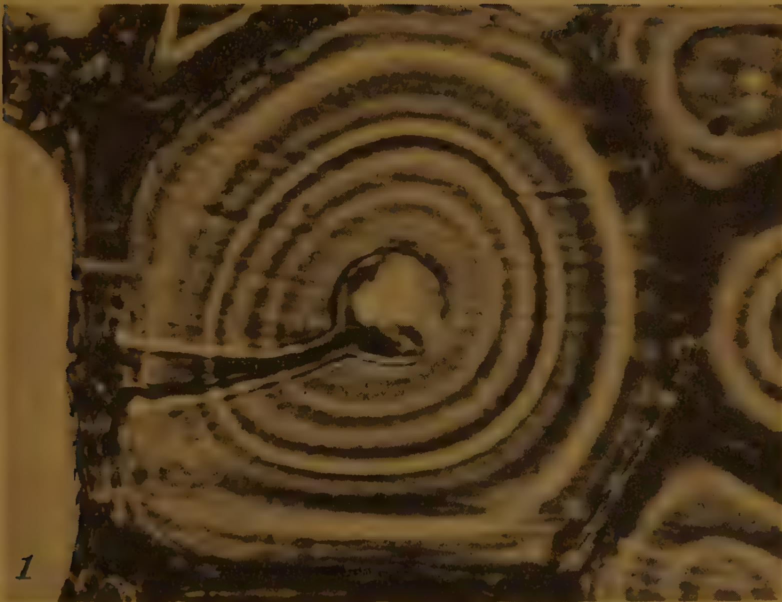
Plate 214

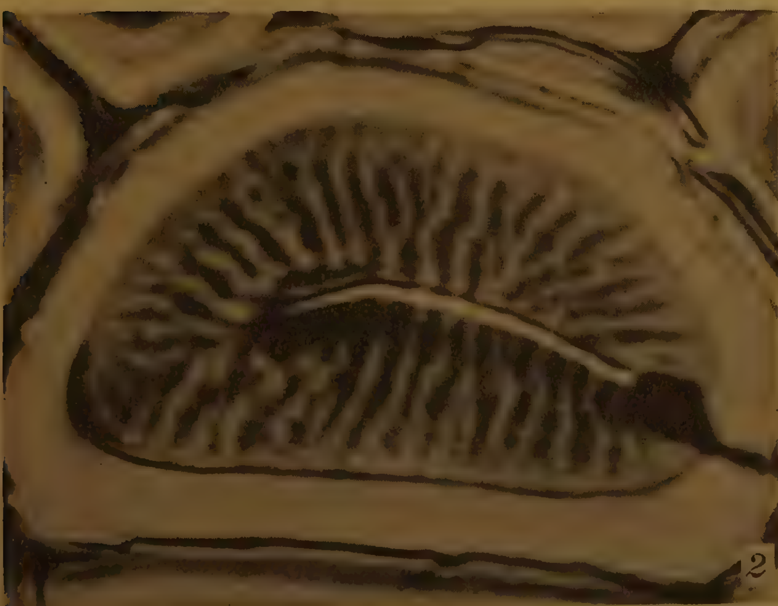
Fig. 14. *Larix occidentalis* Nutt. Transverse section of a latewood tracheid, after treatment with 72% sulphuric acid, showing alternating more porous and less porous lamellae of the secondary wall. Total enlargement due to swelling and microscopic magnification × 9000.

Fig. 15. *Pinus longifolia* Roxb. Transverse section of a latewood tracheid, after treatment with 72% sulphuric acid, showing radial structural pattern of the secondary wall. Total enlargement × 9000.

Fig. 16. *The same.* Transverse section of a "Rotholz" tracheid, after treatment with 72% sulphuric acid, showing radial discontinuities in the secondary wall. Microscopic magnification × 2000.

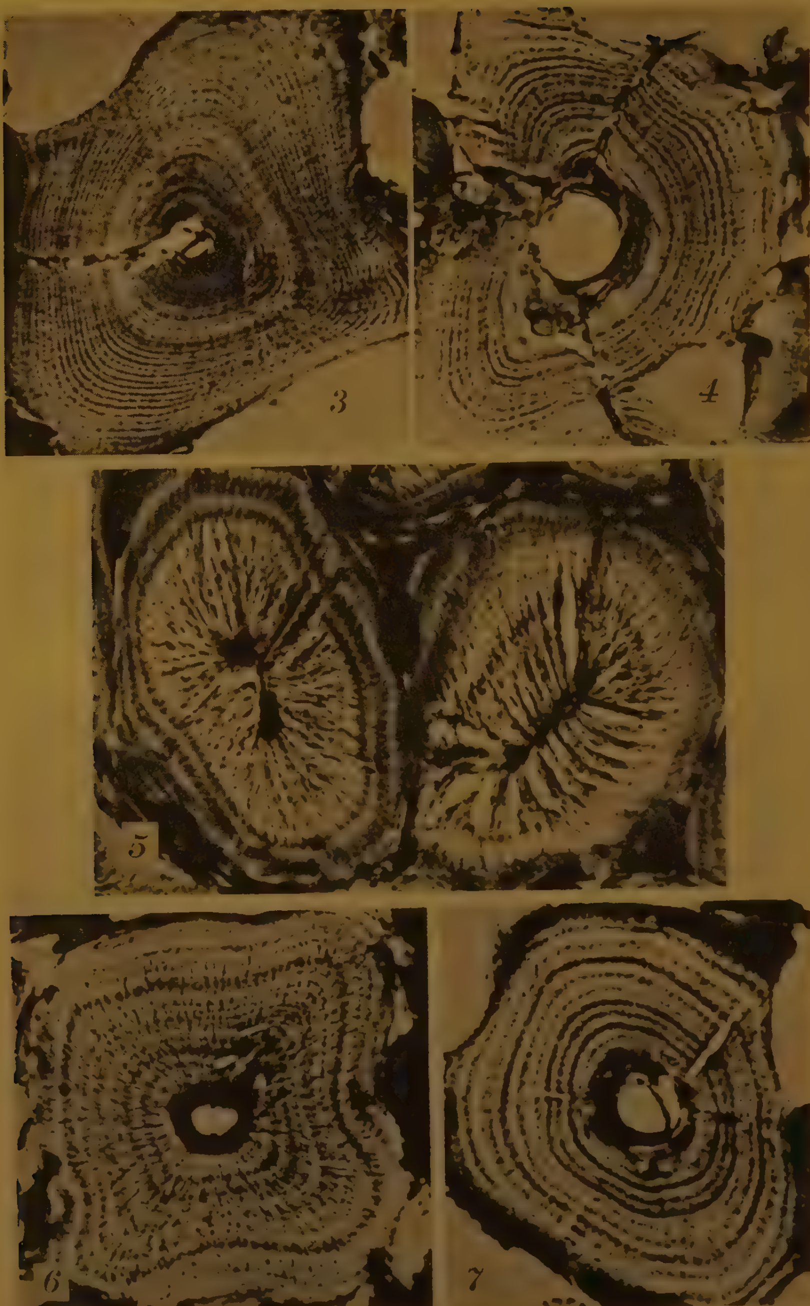
Arnold Arboretum
Harvard University.





STRUCTURAL VARIABILITY OF THE SECONDARY WALL

FULL-TONE—MERIDEN



Structural Variability of the Secondary Wall

FULL-TONE — MERIDEN

Structural Variability of the Secondary Wall

STRUCTURAL VARIABILITY OF THE SECONDARY WALL

NOTES ON THE LIGNEOUS PLANTS DESCRIBED BY H. LEVEILLE FROM EASTERN ASIA

ALFRED REHDER

ADDITIONS AND CORRECTIONS[1]

Populus Bonatii Léveillé. — Rehder in Jour. Arnold Arb. **10**: 112 (1929). — Add: Handel-Mazzetti, Symb. Sin. **7**: 59 (1929).

Populus adenopoda Maximowicz. — Rehder in op. cit. **17**: 65 (1936). — Add as synonym:

Populus rotundifolia var. *macranthela* (Léveillé & Vaniot) Léveillé, Fl. Kouy-Tchéou, 380 (1915); Cat. Pl. Yun-Nan, 250 (1917).

Salix amygdalina var. **nipponica** (Franch. & Sav.) Schneider. — Rehder in op. cit. **10**: 113 (1929).

Salix triandra var. *discolor* "Andersson" ex Nakai, Fl. Kor. Sylv. **18**: 87, t. 11 (1930), vix Andersson

Nakai l. c. enumerates *S. Kinashii* Lévl. together with *S. amygdalina* var. *nipponica* as a synonym of *S. triandra* var. *discolor* [= *S. amygdalina* var. *glaucophylla* (Ser.) Seemen] but it seems doubtful if var. *discolor* is identical with var. *nipponica* which differs in the leaves being pubescent when young and usually smaller and narrower.

Salix koreensis Andersson. — Rehder in op. cit. **10**: 114 (1929). — Nakai in Bull. Soc. Dendr. France, **1928**: 51; Fl. Kor. Sylv. **18**: 164, t. 38 (1930).

Salix pseudo-lasiogyne Léveillé in Fedde, Rep. Spec. Nov. **10**: 436 (1912). — Nakai in Bull. Soc. Dendr. France, **1928**: 47; Fl. Kor. Sylv. **18**: 168, t. 39 (1930).

Nakai (l. c.) enumerates *S. Feddei* Lévl., *S. pogonandra* Lévl., *S. pseudo-Gilgiana* Lévl., and *S. pseudo-jessoensis* Lévl., as synonyms, but considers *S. pseudo-lasiogyne* a distinct species which seems to differ chiefly in its linear-lanceolate to lanceolate leaves, but is hardly specifically different.

Salix hallaisanensis Léveillé in Fedde, Rep. Spec. Nov. **10**: 435 (1912). — Nakai in Tokyo Bot. Mag. **32**: 30 (1918); in Bull. Soc.

[1]Continued from Vol. **18**: 206-257.

Dendr. France, **1928**: 46; Fl. Sylv. Kor. **18**: 129, t. 24 (1930). — Mori, Enum. Cor. Pl. 110 (1922).

Salix caprea "Linnaeus" ex Schneider in Sargent, Pl. Wilson. **3**: 149 (1916). — Rehder in Jour. Arnold Arb. **10**: 116 (1929). — Vix Linné.

Salix hallaisanensis var. *nervosa* Léveillé, l. c.

Nakai (l. c.) takes up Léveillé's name for the plant of northeastern Asia referred by most authors to *S. caprea.* He states that it differs from typical *S. caprea* in having longitudinal striations on the wood under the bark. Such elevated striations are present on the wood of 2–5-year-old branches in *S. aurita* L. and *S. cinerea* L., but are lacking in *S. caprea.* Nakai also refers to *S. hallaisanensis* as *S. hallaisanensis* var. *orbicularis* (Anderss.) Nakai, the Kamschatkan *S. Hultenii* Floderus.

Salix Blinii Léveillé. — Rehder in op. cit. **10**: 117 (1929). — Nakai in Bull. Soc. Dendr. France, **1928**: 46, 51; Fl. Sylv. Kor. **18**: 106, t. 18 (1930).

Nakai refers as Schneider did, *S. Taquetii* Lévl. as a synonym to *S. Blinii* and figures of the latter a sterile branch and a branch with pistillate flowers.

Salix Gilgiana Seemen, Salic. Jap. 59, t. 13a-d (1903). — Léveillé in Bull. Intern. Acad. Géog. Bot. **16**: 145 (1906). — Nakai, Fl. Sylv. Kor. **18**: 112, t. 19 (1930).

Salix gymnolepis Léveillé & Vaniot in Fedde, Rep. Spec. Nov. **3**: 22 (1907). — Matsumura, Ind. Pl. Jap. **2**, pt. 2: 10 (1912).

Salix purpurea L. subsp. *gymnolepis* (Lévl.) Koidzumi in Tokyo Bot. Mag. **27**: 267 (1913).

Salix Makinoana Seemen, p. p.

Nakai refers *S. gymnolepis* Lévl., which was placed by Schneider under *S. Makinoana* Seemen as a synonym, to *S. Gilgiana.* He also cites *S. Makinoana* Seemen, p. p., as a synonym of *S. Gilgiana.* I cannot see any difference between *S. gymnolepis* Lévl. represented in this herbarium by an isotype, and Nakai's illustration of *S. Gilgiana,* nor with the specimens of that species in this herbarium. *Salix Makinoana* is not represented in this herbarium; as long as its staminate flowers are unknown, its position must remain doubtful.

Quercus glandulifera Blume, Mus. Bot. Lugd.-Bat. **1**: 295 (1850).

Quercus serrata Thunberg. — Rehder in op. cit. **10**: 120 (1929).

Quercus coreana Léveillé.

Since *Quercus serrata* Thunb. is being proposed as a nomen ambiguum and will in all probability be accepted as such, the correct name for this species will be *Q. glandulifera* Bl.

Cudrania tricuspidata (Carr.) Bureau in Lavallée, Arb. Segrez. 243 (1877).

Vanieria tricuspidata (Carr.) Hu. — Rehder in op. cit. **17**: 72 (1936).
Morus integrifolia Léveillé & Vaniot.

Since *Cudrania* Tréc. has been proposed as a nomen conservandum and was accepted by a majority vote of the former Committee (cf. Internat. Rules Bot. Nomencl. ed. 3, p. 133, no. 1942. 1935), a vote which will doubtless be finally confirmed, the valid name of the genus will be *Cudrania*.

Lindera communis Hemsley in Jour. Linn. Soc. Bot. **26**: 387 (1891).

Benzoin commune (Hemsl.) Rehder in op. cit. **1**: 144 (1919); **10**: 194 (1929). — Allen in Jour. Arnold Arb. **17**: 330 (1936).

Since *Lindera* Thunb. has been proposed as a nomen conservandum and was accepted by a majority vote of the present Committee (cf. Internat. Rules Bot. Nomencl., ed. 3, p. 134, no. 2821. 1935) this and the two following species will be transferred to *Lindera*, and the synonyms *Litsaea Esquirolii* Lévl., *Litsea Cavaleriei* Lévl., *Lindera Bodinieri* Lévl. and *L. yunnanensis* Lévl. will be referred to *Lindera communis*.

Lindera glauca (Sieb. & Zucc.) Blume, Mus. Bot. Lugd.-Bat. **1**: 325 (1850).

Benzoin glaucum Siebold & Zuccarini. — Rehder in op. cit. **10**: 195 (1929). — Allen in op. cit. **17**: 331 (1936).
Pirus brunnea Léveillé.

Lindera megaphylla Hemsley in Jour. Linn. Soc. Bot. **26**: 389 (1891).

Benzoin grandifolium Rehder in op. cit. **1**: 145 (1919).
Benzoin touyunense (Lévl.) Rehder in op. cit. **10**: 194 (1929), pro parte.
Benzoin touyunense f. *megaphyllum* (Hemsl.) Rehder in op. cit. **11**: 158 (1930). — Allen in op. cit. **17**: 331 (1936).

Under the genus *Lindera*, the oldest specific epithet *L. megaphylla* remains valid, but in transferring the species to *Benzoin*, the epithet had to be changed on account of the older homonym *B. megaphyllum* Kuntze.

Lindera megaphylla f. **touyunensis** (Lévl.), comb. nov.

Litsea touyunensis Léveillé in Fedde, Rep. Spec. Nov. **11**: 63 (1912); Fl. Kouy-Tchéou, 220 (1914).
Benzoin touyunense (Lévl.) Rehder in op. cit. **10**: 194 (1929); **11**: 158 (1930). — Allen in op. cit. **17**: 331 (1936).

This form differs from typical *L. megaphylla* in the pubescent underside of the leaves and is, as I have stated (l. c. **11**: 158–159) less widely distributed than the typical glabrous form.

Dumasia villosa De Candolle. — Rehder in op. cit. **13:** 330 (1932); **18:** 208 (1937). — Handel-Mazzetti, Symb. Sin. **7:** 578 (1933). — Add as a synonym:

Apios Martini Léveillé, Fl. Kouy-Tchéou, 225 (1914).

CHINA. Kweichou: Gan-pin, haies, *L. Martin* in herb. *Bodinier* no. 1825, Aug.–Sept. 1897 (holotype of *Apios Martini;* ex Léveillé et ex Handel-Mazzetti).

Apios Martini was identified with *Dumasia villosa* by Handel-Mazzetti who saw the type.

Campylotropis polyantha (Franch.) Schindler. — Rehder in op. cit. **13:** 329 (1932).

For *Lespedeza dichromocalyx* read:

Lespedeza dichromoxylon Léveillé, Fl. Kouy-Tchéou, 236 (1914); Cat. Pl. Yun-Nan, 157 (1916).

Also in the enumeration of specimens line 2, 4 and 6, change *L. dichromocalyx* to *L. dichromoxylon.*

Pueraria Thunbergiana (Sieb. & Zucc.) Bentham. — Rehder in op. cit. **13:** 331 (1932).

For *Pueraria coerulea* read:

Pueraria caerulea Léveillé & Vaniot in Bull. Soc. Bot. France, **55:** 427 (1908).

Iodes ovalis Blume. — Rehder in op. cit. **15:** 2 (1934).

For *Vitis Seguini* . . . read as follows:

Vitis Seguini Léveillé, Fl. Kouy-Tchéou, 28 (1914), pro parte, specimine typico exclud.

Buddleia officinalis Maxim. f. **albiflora** (Lévl.) comb. nov.

Buddleia Mairei f. *albiflora,* Léveillé, Cat. Pl. Yun-Nan, 171 (1916).

Buddleia acutifolia C. H. Wright f. *albiflora* (Lévl.) Rehder in op. cit. **18:** 234 (1936).

Alstonia Mairei Léveillé. — Rehder in op. cit. **18:** 235 (1937).

Léveillé in his Cat. Pl. Yun-Nan, 279 (1917), refers *A. Mairei* as a synonym to *A. venenata* R. Br. which belongs to a different section.

Triosteum himalayanum Wallich. — Léveillé, Cat. Pl. Yun-Nan, 281 (1917). — Johnston in Jour. Arnold Arb. **18:** 21 (1937). — Rehder in op. cit. **18:** 250 (1937).

Echium connatum Léveillé.

Vernonia arborea Hamilton. — Gagnepain in Bull. Soc. Bot. France, **67:** 364 (1921). — Rehder in op. cit. **18:** 250 (1937).

Vernonia Vanioti Léveillé.

Vernonia volkameriaefolia DeCandolle. — Gagnepain in op. cit.

67: 363 (1921). — Rehder in op. cit. **18:** 250 (1937).
Vernonia Esquirolii Léveillé.

Vernonia saligna DeCandolle. — Gagnepain in op. cit. **67:** 363, 364 (1921). — Rehder in op. cit. **18:** 250 (1937).
Vernonia Martini Vaniot.
Vernonia Seguini Vaniot.

Vernonia arbor Léveillé. — Gagnepain in op. cit. **67:** 363 (1921).
Vernonia papillosa "Franchet" ex Rehder in op. cit. **18:** 251 (1937), quoad syn. *V. Arbor* Lévl.; non Franchet.

Vernonia extensa DeCandolle. — Gagnepain in op. cit. **67:** 363 (1921). — Rehder in op. cit. **18:** 252 (1937).
Vernonia subarborea Vaniot.

Conyza viscidula Wall. ex DeCandolle. — Gagnepain in op. cit. **67:** 363 (1921). — Rehder in op. cit. **18:**252 (1937).
Blumea conyzoides Léveillé.

Inula indica L. var. **hypoleuca** Handel-Mazzetti, Symb. Sin. **7:** 1107 (1936).
Aster lofouensis Léveillé & Vaniot. — Rehder in op. cit. **18:** 252 (1937).

According to Dr. Handel-Mazzetti (in litt.) *Aster lofouensis* is identical with his *Inula indica* var. *hypoleuca*.

Senecio spelaeicola (Vant.) Gagnepain in Bull. Soc. Bot. France, **67:** 364 (1921) "spelaeicolus," in nota.
Senecio Walkeri "Arnott" ex Gagnepain in op. cit. **67:** 363 (1921). — Rehder in op. cit. **18:** 253 (1937). — Quoad syn. *Vernonia spelaeicola;* non Arnott.
Vernonia spelaeicola Vaniot. — Vide Rehder l.c.

In a foot-note, Gagnepain states that *Vernonia spelaeicola* in the Museum herbarium is his *Senecio spelaeicola* and that the labels in the Léveillé herbarium had been interchanged. Doctor Handel-Mazzetti informs me (in litt.) that his *Senecio yalungensis* (Symb. Sin. **7:** 1124) is a synonym of *S. spelaeicola*. The name *Senecio spelaeicola* does not appear in Index Kewensis.

Senecio Hoi Dunn in Jour. Linn. Soc. Bot. **35:** 506 (1933).
Senecio Walkeri "Arnott" ex Gagnepain in op. cit. **67:** 363 (1921). — Rehder in op. cit. **18:** 253 (1937). — Quoad syn. *Vernonia Esquirolii;* non Arnott.
Vernonia Esquirolii Vaniot. — Vide Rehder, l.c.

According to Doctor Handel-Mazzetti (in litt.) *Vernonia Esquirolii* is identical with *Senecio Hoi* Dunn.

INDEX
TO
NOTES ON THE LIGNEOUS PLANTS DESCRIBED BY H. LEVEILLE FROM EASTERN ASIA[1]

ALFRED REHDER

The Index contains all Léveillé's names mentioned in the "Notes on the ligneous plants described by Léveillé from Eastern Asia," beginning in Vol. 10 (1929) and concluded in the present number. The majority of these names proved to be synonyms and these are followed by the name considered correct with reference to the page or pages of Vols. 10–18 of this Journal where the identification was published or additional information given. Author citations are appended to the names, so that the Index can be used to ascertain the identification without looking up the original publication which only needs to be consulted for the discussions and further statements and details. The author citations have been made more complete by the insertion of the parenthetical author citation which was not yet obligatory when most of the notes were published.

Synonyms are printed in *italics;* accepted names in roman.

Abelia *Bodinieri* Lévl. = A. myrtilloides Rehd. 16:334
— Cavaleriei Lévl. 16:335
— *deutziaefolia* Lévl. = A. Schumannii (Graebn.) Rehd. 16:334
— *Mairei* Lévl. = A. Schumannii (Graebn.) Rehd. 16:334
— *parvifolia* "Hemsl." ex Lévl., non Hemsl. = A. myrtilloides Rehd. 16:334
— verticillata Lévl. 16:334
Abutilon Cavaleriei Lévl. = A. indicum (L.) Sweet, 15:94
— *Esquirolii* Lévl. = Urena lobata L. 15:94
Acacia *Cavaleriei* Lévl. = A. Delavayi Franch. 13:321
Acanthopanax Bodinieri Lévl. = Brassaiopsis ciliata Dunn, 15:115
— *Esquirolii* Lévl. = Schefflera spec. 15:114.
Acer *Bodinieri* Lévl. = A. pictum f. tricuspis Rehd. 15:5
— *Cavaleriei* Lévl. = A. Davidi Franch. 15:7

[1]See Vols. **10**: 108-132, 184-196, 282; **12**: 275-281; **13**: 299-332, 464; **14**: 223-252, 426; **15**: 1-27, 89-117, 267-326, 377; **16**: 311-340; **17**: 53-82, 316-340, 371; **18**: 26-53, 206-257, 273-277, 361

Acer coriaceifolium Lévl. 15:6
— *cucullobracteatum* Lévl. = A. crataegifolium Sieb. & Zucc. 15:7
— *Dielsii* Lévl. = Dipteronia sinensis Oliver, 15:4
— *Fauriei* Lévl. = A. Negundo L. 15:8
— *Hayatae* Lévl. & Vant. = A. Miyabei Maxim. 15:4
— — var. *glabra* Lévl. & Vant. = A. pictum Thunb. 15:5
— *lasiocarpum* Lévl. & Vant. = A. caudatum Wall. var. ukurunduense (Maxim.) Rehd. 15:5
— *oblongum* var. *erythrocarpum* Lévl. = A. oblongum var. biauritum W. W. Smith, 15:6
— *palmatum* var. *plicatum* Lévl. = A. argutum Maxim. 15:8
— *Paxii* Franch. var. *integrifolia* Lévl. = A. oblongum Wallich ex DC. 15:5
— *pellucidobracteatum* Lévl. & Vant. = A. Tschonoskii Maxim. 15:7
— *Prainii* Lévl. = A. Fabri Hance var. rubrocarpum Metcalf, 15:6
— *trifidum* Hook. & Arn. var. *formosanum* Hay. ex Lévl. = A. Buergerianum Miq. var. formosanum (Hay. ex Koidz.) Rehd. 18:216
Acronychia Esquirolii Lévl. = Alstonia yunnanensis Diels, 15:315; 18:235
Actinidia *arguta* Planch. var. *Dunnii* Lévl. = A. purpurea Rehd. 15:96
— *Dielsii* Lévl. = A. Fortunati Fin. & Gagn. 15:97
— Rubus Lévl. 15:97
Adina *Fauriei* Lévl. = A. rubella Hce. 18:247
Aeschynanthus Dunnii Lévl. = Phlogacanthus pubinervis T. Anders. 16:315
— *Esquirolii* Lévl. = Bucklandia populnea R. Brown ex Wall. 17:333
Aganosma *Schlechterianum* Lévl. = A. cymosa (Roxb.) G. Don, 15:315; 18:237
Agapetes vaccinoidea Lévl. = Vaccinium japonicum var. sinicum (Nakai) Rehd. 15:288
Ailanthus Esquirolii Lévl. = ? 14:227
Akebia *Cavaleriei* Lévl. [= *Holboellia* spec. 10:189] = Stauntonia obovata Hemsl. 17:320; 18:256
— *Chaffanjoni* Lévl. = A. trifoliata Koidz. var. australis (Diels) Rehd. 10:189
— *lobata* var. *Chaffanjoni* Lévl. = A. trifoliata Koidz. var. australis (Diels) Rehd. 10:189
Albizzia *Esquirolii* Lévl. = A. kalkora (Roxb.) Prain, 13:321
Alchornea Mairei Lévl. [= *Tragia involucrata* L. 14: 234] = Tragia Mairei (Lévl.) Rehd. 18:214
— *Vanioti* Lévl. = Croton Tiglium L. 14:232

Allomorphia Bodinieri Lévl. = Blastus pauciflorus (Benth.) Guillaumin, 15:111
— *Cavaleriei* Lévl. & Vant. = Phyllagathis Cavaleriei (Lévl. & Vant.) Guillaum. 15:113; 18:227, 361
Alnus Fauriei Lévl. & Vant. 10:118; 17:66
— *Mairei* Lévl. = A. nepalensis D. Don, 17:67
Alstonia *Esquirolii* Lévl. = A. yunnanensis Diels, 15:315; 18:235
— Mairei Lévl. 15:315; 18:235, 276
Alyxia Schlechteri Lévl. (1911) 15:316; 18:235
— *Schlechteri* Lévl. (1914) = Podocarpus neriifolius D. Don, 17:54
Andrachne Bodinieri Lévl. 14:229
— *Cavaleriei* Lévl. = Lysimachia capillipes Hemsl. var. Cavaleriei (Lévl.) Hand.-Mazz. 15:294; 18:232
— Esquirolii Lévl. 14:229; 18:212
— *hypoglauca* Lévl. = A. Bodinieri Lévl. 14:229
— *Milliettii* Lévl. = Lysimachia Milliettii (Lévl.) Hand.-Mazz. 18:232
— *persicariifolia* Lévl. = A. Esquirolii (Lévl.) 14:229; 18:257, 361
Anisophyllea Cavaleriei Lévl. = Vaccinium foetidissimum Lévl. & Vant. 15:286
Antidesma *Seguini* Lévl. = A. microphyllum Hemsl. 14:232
Antirrhaea Esquirolii Lévl. = Ecdysanthera rosea Hook. & Arn. 18:235
— *Martini* Lévl. = Sindechites Henryi Oliv. 18:238
Apios Mairei Lévl. = Dumasia villosa DC. 13:330
— *Martini* Lévl. = Dumasia villosa DC. 18:208, 276
Aralia Bodinieri Lévl. = Nothopanax Delavayi (Franch.) Harms, 15:115
— *Labordei* Lévl. = Toddalia asiatica (L.) Lam. 14:226
— *Mairei* Lévl. = Tetrapanax papyrifera (Hook.) K. Koch, 15:113
Ardisia *Bodinieri* Lévl. = A. brevicaulis Diels, 15:289
— *castaneifolia* Lévl. = A. Faberi Hemsl. 15:291
— *Cavaleriei* Lévl. = A. Faberi Hemsl. 15:291
— *crispa* var. *Taquetii* Lévl. = A. crispa (Thbg.) A. DC. 15:289
— *Dielsii* Lévl. [= *A. Henryi* Hemsl. var. *Dielsii* (Lévl.) Walk. 15:290] = A. crispa (Thunb.) DC. 18:232
— *discolor* Lévl. = Cornus oblonga Wall. 15:116
— *elegantissima* Lévl. = A. elegans Andr. 15:290
— *Esquirolii* Lévl. = Lysimachia lancifolia Craib, 15:294
— *Labordei* Lévl. = A. crispa (Thbg.) A. DC. 15:289
— *Mairei* Lévl. = Chloranthus brachystachyus Bl. 10:111
— *Meziana* Lévl. = A. tenera Mez, 15:289
— *perforata* Lévl. = Alangium Faberi var. perforatum (Lévl.) Rehd. 15:108

Ardisia *Taquetii* Lévl. = A. crispa (Thbg.) A. DC. 15:289
Argyreia Seguini Vaniot ex Lévl. 15:319; 18:242
Aristolochia *Blinii* Lévl. = Ceropegia Balfouriana Schlechter, 18:240
— *Bonatii* Lévl. = A. moupinensis Franch. 10:184
— Feddei Lévl. 10:184
— *Mairei* Lévl. = Ceropegia Balfouriana Schlechter, 18:240
— *viridiflora* Lévl. = Ceropegia Balfouriana Schlechter, 18:240
— — var. *occlusa* Lévl. = Ceropegia Balfouriana Schlechter, 18:240
Artabotrys Esquirolii Lévl. p. p. = Desmos cochinchinensis Lour. 17:234
— *Esquirolii* Lévl. p. p. = Holboellia coriacea Diels, 10:189; 17:321
Aspidopterys Cavaleriei Lévl. (1911), 14:228
— *Cavaleriei* Lévl. (1914) = Combretum Wallichii DC. 15:108
— *Dunniana* Lévl. = A. Cavaleriei Lévl. 14:228
— Esquirolii Lévl. 14:228, 426
— *hypoglauca* Lévl. = Tripterygium hypoglaucum (Lévl.) Hutchins. 14:252; 18:216
Aster Cavaleriei Vant. & Lévl. = Microglossa albescens (DC.) Clarke, 18:252
— *lofouensis* Lévl. & Vant. 18:252 = Inula indica var. hypoleuca Hand.-Mazz. 18:277
Baccaurea Cavaleriei Lévl. 14:231
— *Esquirolii* Lévl. = Sapium rotundifolium Hemsl. 14:234
Barthea Blinii Lévl. = Plagiopetalum Esquirolii (Lévl.) Rehd. 15:110
— *Cavaleriei* Lévl. p. p. = Plagiopetalum Esquirolii (Lévl.) Rehd. 15:110
— *Cavaleriei* Lévl. p. p. = Bredia Cavaleriei (Lévl.) Diels, 15:112
Bauhinia *altefissa* Lévl. = B. yunnanensis Franch. 13:322
— aurea Lévl. 13:322
— *Cavaleriei* Lévl. = B. densiflora Franch. 13:321
— *Rocheri* Lévl. = B. touranensis Gagnep. 13:321
Berberis *bicolor* Lévl. 10:189; 17:322
— *Bodinieri* Lévl. = B. Wilsonae Hemsl. 10:189
— Cavaleriei Lévl. (1911) [= *B. Griffithiana* Schneid. 10:189] 14:251 sub Gymnosporia Esquirolii; 17:321
— *Cavaleriei* Lévl. (1914) = Gymnosporia Esquirolii Lévl. 14:250
— *elegans* Lévl. = Mahonia elegans (Lévl.) Rehd. 17:322
— *Esquirolii* Lévl. = Gymnosporia Esquirolii Lévl. 14:250
— *Ganpinensis* Lévl. = Mahonia ganpinensis (Lévl.) Fedde, 10:190
— *stenophylla* "Hance" ex Lévl., non Hance = B. Julianae Schneid. 17:322
Berchemia alnifolia Lévl. = Corylopsis alnifolia (Lévl.) Schneid. 12:280

Berchemia Cavaleriei Lévl. = Sageretia Henryi Drum. & Sprague, 15:13
— *Chaneti* Lévl. = Sageretia theezans (L.) Brongn. 15:13
Betula *vulcani* Lévl. & Vant. = B. Ermani Cham. var. subcordata (Reg.) Koidz. 10: 118
Bileveillea granulatifolia Lévl. = Blumea lanceolaria (Roxb.) Druce, 18:253
Biophytum Esquirolii Lévl. 18:209
Blastus *Cavaleriei* Lévl. & Vant. = B. pauciflorus (Benth.) Guillaumin, 15:111
— Dunnianus Lévl. 15:111
— *Lyi* Lévl. = Fordiophyton Faberi Stapf, 15:112
— *Mairei* Lévl. = Bredia yunnanensis (Lévl.) Diels, 15:112
— *Marchandii* Lévl. = B. cochinchinensis Lour. 15:111
— *yunnanensis* Lévl. = Bredia yunnanensis (Lévl.) Diels, 15:112
Blumea conyzoides Lévl. & Vant. = Conyza viscidula Wall. ex DC. 18:252, 277
— *granulatifolia* (Lévl. & Vant.) Lévl. = B. lanceolaria (Roxb.) Druce, 18:253
Bodiniera thalictrifolia Lévl. & Vant. = Boenninghausenia albiflora (Hook.) Meissn. 14:225; 18:210
Bodinierella Cavaleriei Lévl. = Enkianthus chinensis Franch. 15:279; 18:230
Boea Cavaleriei Lévl. & Vant. = Rhabdothamnopsis chinensis (Franch.) Hand.-Mazz. 18:246
Boenninghausenia *brevipes* (Franch.) Lévl. = B. albiflora var. brevipes Franch. 14:225; 18:210
— *sessilicarpa* Lévl. = B. albiflora var. brevipes Franch. 14:225; 18:210
Bredia Bodinieri Lévl. = Blastus pauciflorus (Benth.) Guillaumin, 15:311
— *Cavaleriei* Lévl. & Vant. = Fordiophyton Faberi Stapf, 15:112
— *Mairei* Lévl. = Fordiophyton Faberi Stapf, 15:112
— *soneriloides* Lévl. = Oxyspora paniculata DC. 15:110
Buddleia *Mairei* Lévl. [= *B. acutifolia* C. H. Wright, 15:310] = B. officinalis Maxim. 18:234
— *Mairei* f. *albiflora* Lévl. [= B. *acutifolia* f. *albiflora* (Lévl.) Rehd. 15:310] = B. officinalis Maxim. f. albiflora (Lévl.) Rehd. 18:276
— *plectranthoidea* Lévl. = Leucosceptrum plectranthoideum (Lévl.) Marqand, 16:311
— *truncatifolia* Lévl. = B. tibetica W. W. Sm. var. truncatifolia (Lévl.) Marquand, 15:310; 18:234
Buxus *Bodinieri* Lévl. = B. microphylla var. aemulans Rehd. & Wils. 14:236, 426

Buxus *cephalantha* Lévl. & Vant. = B. Harlandi Hance var. cephalantha (Lévl. & Vant.) Rehd. 14:237.
— megistophylla Lévl. 14:236; 18:215
— Myrica Lévl. 14:236; 18:215
— *sempervirens* var. *microphylla* "S. & Z." ex Lévl., non S. & Z. = B. Harlandi Hance var. cephalantha (Lévl. & Vant.) Rehd. 14:237
Callicarpa Bodinieri Lévl. 15:321; 18:243
— *Cavaleriei* Lévl. = Ilex purpurea Hassk. 14:239
— *Dunniana* Lévl. = C. macrophylla Vahl, 15:320
— *Esquirolii* Lévl. (No. 551) = Caryopteris paniculata C. B. Clarke, 18:243
— *Esquirolii* Lévl. (No. 665) = Dichroa febrifuga Lour. 12:278
— *Feddei* Lévl. = C. Bodinieri Lévl. 15:321
— *Lyi* Lévl. = C. Bodinieri var. Lyi (Lévl.) Rehd. 15:322; 18:243
— *macrophylla* var. *Kouytchensis* Lévl. = C. macrophylla Vahl, 15:320
— *Mairei* Lévl. = C. Bodinieri var. Giraldii (Rehd.) Rehd. 15:322; 18:243
— *Martini* Lévl. = Caryopteris paniculata C. B. Clarke, 15:326; 18:243
— *panduriformis* Lévl. = C. rubella Lindl. var. Hemsleyana Diels, 15:323
— *Seguini* Lévl. = C. Bodinieri Lévl. 15:321
— *Taquetii* Lévl. = C. dichotoma (Lour.) Raeusch. 15:324
Camellia Costei Lévl. [= *Thea Costei* (Lévl.) Rehd. 15:98] 18:223
— *japonica* "L." ex Lévl., non L. [= *Thea Pitardii* (C. Stuart) Rehd. 15:98] = Camellia Pitardii C. Stuart, 18:723
Canthium Cavaleriei Lévl. = Lasianthus spec. 16:324
— *Dunnianum* Lévl. = Lasianthus Hartii Franch. 16:323; 18:249
— *Henryi* Lévl. = Prismatomeris Henryi (Lévl.) Rehd. 16:328
— *Labordei* Lévl. [= *Lasianthus Labordei* (Lévl.) Rehd. 13:340; 16:323] = Prismatomeris Labordei (Lévl.) Merr. 18:249
Capparis Bodinieri Lévl. 10:195
— masaikai Lévl. p. p. 10:195
— *masaikai* Lévl. p. p. = Reevesia pubescens Mast. 15:96
Caragana *Komarovi* Lévl. = C. Franchetiana Komar. 13:326
Carpinus *Esquirolii* Lévl. = Engelhardtia Colebrookiana Lindl. 10:118
— *laxiflora* Bl. var. *chartacea* Lévl. = C. laxiflora Bl. 17:67
— *pinfaensis* Lévl. & Vant. = C. Seemeniana Diels, 17:67
Carrierea Dunniana Lévl. 15:102
Caryopteris Esquirolii Lévl. = Pogostemon glaber Benth. 16:313
— *fluminis* Lévl. = Colquhounia Seguini Vaniot, 16:311
— *Mairei* Lévl. = Teucrium palmatum Benth. 18:244, 361

Cassiope *Mairei* Lévl. = C. selaginoides Hooker f. & Thoms. 15:280
Castanea Bodinieri Lévl. & Vant. = Castanopsis hystrix (Hook. f. & Th.) A. DC. 10:118; 17:68
— *Fauriei* Lévl. & Vant. = Castanopsis cuspidata (Thbg.) Schottky, 17:68
Castanopsis *asymetrica* Lévl. [= *C. caudata* Franch. 10:119] = C. Eyrei (Champ.) Tutcher, 17:69
— *Cavaleriei* Lévl. = Sloanea sinensis (Hance) Hu, 15:91
— *yunnanensis* (Franch.) Lévl. = Castanea mollissima Bl. 17:68
— *spec.* Lévl. = Gordonia axillaris (Ker) Szysz. 18:224
Cavaleriea enkianthoidea Lévl. = Ribes laurifolium Jancz. 12:279
Cavaleriella cordata Lévl. = Aspidopterys Esquirolii Lévl. 14:228, 426
— *Dunniana* Lévl. = Dipelta yunnanensis Franch. 16:333
Celastrus *Bodinieri* Lévl. = Ilex purpurea Hassk. 14:239
— *Cavaleriei* Lévl. (1914) = Myrsine semiserrata Wall. 15:292
— *Cavaleriei* Lévl. (1916) = C. stylosa Wall. 14:250
— *clemacanthus* Lévl. = C. flagellaris Rupr. 14:250
— *Esquiroliana* Lévl. = Rhamnus crenatus Sieb. & Zucc. 15:13
— *Esquirolii* Lévl. = Sabia parviflora Wall. var. nitidissima Lévl. 15:10
— *euonymoidea* Lévl. [= *Grewia biloba* G. Don, 15:92] = Grewia Feddei (Lévl.) Burret, 18:220
— *Feddei* Lévl. p. p. = Grewia Feddei Burret, 18:220
— *Feddei* Lévl. p. p. = Grewia Henryi Burret, 18:221
— *Kouytchensis* Lévl. = Rhamnus crenatus Sieb. & Zucc. 15:13
— *Lyi* Lévl. = Rhamnus Esquirolii Lévl. 15:14
— *Mairei* Lévl. = Sabia yunnanensis Franch. 15:9
— *salicifolia* Lévl. = Ilex macrocarpa Oliver, 14:242
— *Seguini* Lévl. = Myrsine semiserrata Wall. 15:292
— *suaveolens* Lévl. = Ilex suaveolens (Lévl.) Loes. 14:239
— *tristis* Lévl. = Rhamnus napalensis (Wall.) M. A. Laws. 15:14
— *yunnanensis* Lévl. = Premna parvilimba P'ei, 15:324
Celtis Bodinieri Lévl. 10:122
— *Bungeana* Bl. var. *heterophylla* Lévl. = C. Biondii Pamp. var. heterophylla (Lévl.) Schneid. 10:123; 18:255
— *Cavaleriei* Lévl. = C. Biondii Pamp. var. Cavaleriei (Lévl.) Schneid. 10:123
— *Mairei* Lévl. = C. Bungeana Bl. 10:122
— *polycarpa* Lévl. = Bischofia javanica Bl. 18:213
Cephalanthus Cavaleriei Lévl. = Uncaria scandens (Sm.) Hutchins. 16:319
— *Esquirolii* Lévl. = Camptotheca acuminata Dcne. 18:226, 361

Cephalanthus Navillei Lévl. = Neonauclea Navillei (Lévl.) Rehd. 16:319
Chionanthus *coreanus* Lévl. = C. retusa var. coreana (Lévl.) Nakai, 15:304
— *retusa* var. *Mairei* Lévl. = C. retusa Lindl. & Paxt. 15:304
Chloranthus *Esquirolii* Lévl. = C. brachystachyus Bl. 10:111
Chrysanthemum *indicum* L. var. *coreanum* Lévl. = C. indicum L. 18:253
Cinnamomum Bodinieri Lévl. 17:324
— *Cavaleriei* Lévl. = C. Parthenoxylon Meissn. in DC. 17:325
— *Esquirolii* Lévl. = Cocculus laurifolius DC. 17:323
— Mairei Lévl. 10:192
— *Taquetii* Lévl. = C. Camphora Nees & Eberm. 17:324
Citrus *Cavaleriei* Lévl. ex Cavalerie = C. ichangensis Swingle, 14:227
Cladrastis Fauriei Lévl. = Maackia Fauriei (Lévl.) Takeda, 13:323
Clausena Dunniana Lévl. 14:226; 18:210
— *Esquirolii* Lévl. = Glycosmis Esquirolii (Lévl.) Tanaka, 14:226
— *excavata* "Burm." ex Lévl., non Burm. = C. Dunniana Lévl. 18:210
— *Willdenowii* "W. & A." ex Lévl., non Wight & Arn. = C. Dunniana Lévl. 14:226
Clematis *Cavaleriei* Lévl. & Porter = C. chinensis Retz. 10:187
— Chanetii Lévl. 10:188
— Clarkeana Lévl. & Vant. 10:185
— *Coreana* Lévl. = C. fusca Turcz. 10:185
— *coriigera* Lévl. = C. trullifera Fin. & Gagnep. 17:318
— *dioscoreifolia* Lévl. & Vant. = C. paniculata Thbg. var. dioscoreifolia (Lévl. & Vant.) Rehd. 10:188
— *Drakeana* Lévl. & Vant. = C. uncinata Champ. 10:188
— Duclouxii Lévl. 10:187
— *Esquirolii* Lévl. & Vant. = C. smilacifolia Wall. 10:187
— *Finetiana* Lévl. & Vant. = C. Pavoliniana Pamp. 10:187; 18:256
— *funebris* Lévl. & Vant. = C. chinensis Retz. 10:187
— *Gagnepainiana* Lévl. & Vant. = C. uncinata Champ. 10:188
— *Kuntziana* Lévl. & Vant. = C. montana Buch.-Ham. ex DC. 10:186
— *Mairei* Lévl. = ? C. ranunculoides Franch. var. tomentosa Fin. & Gagnep. 17:317
— *Martini* Lévl. = C. Gouriana Roxb. ex DC. 10:188; 17:318
— *oligocarpa* Lévl. & Vant. = C. chinensis Retz. 10:187
— *Philippiana* Lévl. & Vant. = C. pterantha Dunn, 10:186
— *splendens* Lévl. & Vant. p. p. = C. Leschenaultiana DC. 10:186
— *splendens* Lévl. & Vant. p. p. = C. rubifolia Wright, 10:186
— *urophylla* "Franch." ex Lévl., non Franch. = C. ranunculoides Franch. var. tomentosa Fin. & Gagnep. 17:317

Clematis *urophylla* var. *heterophylla* Lévl. = C. ranunculoides Franch. var. tomentosa Fin. & Gagnep. 17:317
— Vanioti Lévl. & Porter, 10:186
— *Vitalba* L. var. *argentilucida* Lévl. & Vant. = C. grata Wall. var. argentilucida (Lévl. & Vant.) Rehd. 17:318
— — *Ganpiniana* Lévl. & Vant. = C. parviloba Gardn. & Champ. var. ganpiniana (Lévl. & Vant.) Rehd. 17:319
— — var. *micrantha* Lévl. & Vant. = C. Gouriana Roxb. ex DC. 17:318
Clerodendron *Bodinieri* Lévl. = C. mandarinorum Diels, 15:325
— — *Cavaleriei* (Lévl.) Lévl. = C. mandarinorum Diels, 15:325
— *Cavaleriei* Lévl. = C. mandarinorum Diels, 15:325
— *Darrisii* Lévl. = C. japonicum (Thbg.) Sweet, 15:325
— *Esquirolii* Lévl. (no. 943) = Tacca Esquirolii (Lévl.) 17:64
— *Esquirolii* Lévl. (no. 961) = C. japonicum (Thbg.) Sweet, 15:325
— *Leveillei* Fedde ex Lévl. = C. japonicum (Thbg.) Sweet, 15:325
Clethra Bodinieri Lévl. 15:267; 18:228
— Cavaleriei Lévl. 15:267; 18:228
— *Esquirolii* Lévl. = C. Cavaleriei Lévl. 15:267; 18:228
— kaipoensis Lévl. 15:268; 18:228
— *lineata* Lévl. = C. Cavaleriei Lévl. 15:267
— *pinfaensis* Lévl. = C. kaipoensis Lévl. 15:268
Colquhounia Seguini Vaniot, 16:311
Corchorus Cavaleriei Lévl. = Helicteres glabriuscula Wall. 15:96
Cornus *Amblardi* Lévl. = C. paucinervis Hance, 15:117
— *Bodinieri* Lévl. = C. macrophylla Wall. 15:116
— *capitata* var. *hypoleuca* Lévl. = C. capitata Wall. var. mollis Rehd. 15:117
— *Esquirolii* Lévl. = Adina racemosa Miq. 16:319
— *Fauriei* Lévl. = C. canadensis L. 15:117
— *rosea* Lévl. = C. Monbeigii Hemsl. 15:116
Corylopsis *Cavaleriei* Lévl. = C. Wilsonii Hemsl. 12:281
Cotoneaster *Blinii* Lévl. = Photinia Blinii (Lévl.) Rehd. 17:335
— *Bodinieri* Lévl. = Docynia Delavayi (Franch.) Schneid. 13:309
— *coreanus* Lévl. = Symplocos paniculata (Thbg.) Miq. 15:297
— *Esquirolii* Lévl. = Photinia Esquirolii (Lévl.) Rehd. 17:334
— *Mairei* Lévl. = C. Franchetii Bois, 13:302
— — var. *albiflora* Lévl. = C. Franchetii Bois, 13:302
Crataegus *Academiae* Lévl. = Xylosma racemosum (Sieb. & Zucc.) Miq. 15:101
— *Argyi* Lévl. & Vant. = C. cuneata Sieb. & Zucc. 13:303
— *biloba* Lévl. = Symplocos paniculata f. biloba (Lévl.) Rehd. 15:297

Crataegus *Bodinieri* Lévl. = C. scabrifolia (Franch.) Rehd. 13:302
— *Cavaleriei* Lévl. & Vant. (1908) = Malus Sieboldii (Reg.) Rehd. 13:308
— *Cavaleriei* Lévl. (1915) = Photinia parvifolia Schneid. 13:305
— *Chantcha* Lévl. = C. cuneata Sieb. & Zucc. 13:303
— *coreanus* Lévl. = C. pinnatifida Bge. 13:303
— *Lyi* Lévl. = Symplocos paniculata (Thbg.) Miq. 15:297
— *Pomasae* Lévl. = Deutzia glabrata Komar. 12:276
— *stephanostyla* Lévl. & Vant. = C. cuneata Sieb. & Zucc. 13:303
— *Taquetii* Lévl. = Malus Sieboldii (Reg.) Rehd. 13:308
Crotalaria Mairei Lévl. 18:206
— *spec.* Lévl. = Polygala arillata D. Don, 18:211
Cudrania Bodinieri Lévl. = Capparis cantoniensis Lour. 17:332; 18:257
Cunninghamia *sinensis* var. *prolifera* Lemée & Lévl. = C. lanceolata (Lamb.) Hook. 17:55
Cupressus Mairei Lévl. [= *C. Duclouxiana* Hickel, 10:110] = Cryptomeris japonica (L. f.) D. Don, 17:55
Cynanchum *Boudieri* Lévl. & Vant. = C. caudatum (Miq.) Maxim. 18:239
— *tylophoroideum* Schlechter ex Lévl. = C. Mooreanum Hemsl. 18:239
— *yunnanense* Lévl. [= *Paederia Wallichii* Hook. f. 16:325] = P. yunnanensis (Lévl.) Rehd. 18:249
Dalbergia Cavaleriei Lévl. 13:330; 18:208
— Esquirolii Lévl. 13:329, 464
Damnacanthus Esquirolii Lévl. [= *Arduina Carandas* (L.) K. Schum. 15:312] = Carissa Carandas L. 18:235
Daphne *Argyi* Lévl. = Myrica rubra Sieb. & Zucc. 10:118
— *Bodinieri* Lévl. (1914) [= Alyxia *Bodinieri* (Lévl.) Woods. 15:316] = A. Schlechteri Lévl. 18:235
— *Bodinieri* Lévl. (1915) = D. tangutica Maxim. 15:104
— *Cavaleriei* Lévl. = D. papyracea Wall. ex Meissn. 15:105
— Esquirolii Lévl. 15:105
— Feddei Lévl. 15:105; 18:226
— *leuconeura* var. *Mairei* Rehd. & Lévl. = D. Esquirolii Lévl. 15:105
— *Mairei* Lévl. = D. papyracea Wall. ex Meissn. 15:105
— *Martini* Lévl. = D. Feddei Lévl. 15:105
— *salicina* Lévl. = Wikstroemia salicina (Lévl.) Lévl. & Blin, 15:104
Daphniphyllum Cavaleriei Lévl. = Nyssa sinensis Oliver, 15:107
Dendropanax morbiferus Lévl. 18:227
Desmodium *barbigerum* Lévl. = D. concinnum DC. 13:328
— *Bodinieri* Lévl. = D. racemosum (Thunb.) DC. 13:326

Desmodium *Cavaleriei* Lévl. = D. gangeticum (L.) DC. 13:328
— Esquirolii Lévl. [= *D. cinerascens* Franch. 13:327] 18:207
— *oxalidifolium* Lévl. p. p. = D. gyroides (Roxb.) DC. 13:327
— *oxalidifolium* Lévl. p. p. = D. Griffithianum Benth. 13:327
Deutzia *Chaffanjoni* Lévl. [= *D. lancifolia* Rehd. 12:276] = D. Esquirolii (Lévl.) Lévl. 14:202; 17:333
— *Chanetii* Lévl. = Philadelphus pekinensis Rupr. 12:275
— coreana Lévl. 12:276
— cyanocalyx Lévl. 12:276
— *Esquirolii* Lévl. [= *D. lancifolia* Rehd. 12:276] = D. Esquirolii (Lévl.) Rehd. 14:202; 17:333
— *Fauriei* Lévl. = D. glabrata Komar. 12:276
— *funebris* Lévl. = Brandisia racemosa Henry 16:315; 18:345
— *mollis* var. *erythrocalyx* Lévl. = Philadelphus Henryi Koehne, 12:275
Dichroa *Henryi* Lévl. = D. febrifuga Lour. 12:278
Didymocarpus Cavaleriei Lévl. = Aeschynanthus spec. 18:246
Diospyros *Argyi* Lévl. = D. Kaki L. f. var. silvestris Mak. 15:295
— *Bodinieri* Lévl. = Ilex macrocarpa Oliv. 14:242; 18:215
— *Chaffanjoni* Lévl. = Cotoneaster horizontalis Decne. 13:302, 464
— Esquirolii Lévl. 15:294; 18:233
— *Mairei* Lévl. = D. mollifolia Rehd. & Wils. 15:294
— *Navillei* Lévl. = Lysimachia Navillei (Lévl.) Hand.-Mazz. 15:293
Dischidia yunnanensis Lévl. = Tylophora spec. 18:241
Distylium *Dunnianum* Lévl. = D. chinense (Fr.) Diels, 12:280
Dysoxylon Esquirolii Lévl. [= *Chickrasia tabularis* A. Juss. 14:227, 426] = Chukrassia tabularis A. Juss. 18:210
Echinocarpus Cavaleriei Lévl. = Evonymus subtrinervis Rehd. 14:247
— *erythrocarpa* Lévl. = Evonymus acanthocarpa Franch. 14:246
— *Esquirolii* Lévl. = Evonymus subtrinervis Rehd. 14:247
— *hederaerhiza* Lévl. = Evonymus aculeata Hemsl. 14:246
Echium connatum Lévl. = Triosteum himalayanum Wall. ex Roxb. 18:250, 276
Ehretia *Argyi* Lévl. = E. acuminata R. Br. 18:243
— Dunniana Lévl. 15:320
— *Esquirolii* Lévl. (1913) = ?; see under Tarenna mollissima, 16:320
— *Esquirolii* Lévl. (1914) = Tarenna mollissima (H. & A.) Merr. 16:320
Elaeagnus *Argyi* Lévl. = E. umbellata Thunb. 18:226
— *coreanus* Lévl. = E. umbellata Thunb. 18:226
— *umbellata* var. *coreana* (Lévl.) Lévl. 18:226 = E. umbellata Thunb. 18:226

Eleutherococcus Bodinieri Lévl. = Schefflera spec. 15:115
— *Mairei* Lévl. = Aralia chinensis L. var. nuda Nakai, 15:116
Elsholtzia *Bodinieri* Vant. var. *lavandulaespica* (Lévl.) Lévl. = E. heterophylla Diels, 18:244
— *Cavaleriei* Lévl. = Leucosceptrum chinense Hemsl. 16:311
— *Dielsii* Lévl. = E. fruticosa (D. Don) Rehd. 16:312
— *Labordei* Vaniot = E. rugulosa Hemsl. 16:312
— *lampradena* Lévl. = E. ochroleuca Dunn, 16:313
— *lavandulaespica* (Lévl.) Lévl. = E. heterophylla Diels, 18:244
— *Lychnitis* Lévl. & Vant. = Plectranthus ternifolius D. Don, 16:313
— *Souliei* Lévl. (no. 529, non 482) = E. fruticosa (D. Don) Rehd. 16:312
— *tristis* Lévl. = E. fruticosa (D. Don) Rehd. 16:312
Embelia *Blinii* Lévl. = E. pauciflora var. Blinii (Lévl.) Walker, 15:292
— *Bodinieri* Lévl. = E. oblongifolia Hemsl. 15:291; 18:232
— *Cavaleriei* Lévl. = Ilex metabaptista Loes. var. myrsinoides (Lévl.) Rehd. 14:240
— *Dielsii* Lévl. = E. pauciflora var. Blinii (Lévl.) Walker, 15:292
— *Esquirolii* Lévl. = Celastrus gemmata Loes. 14:250
— *Kaopoensis* Lévl. = E. pauciflora var. Blinii (Lévl.) Walker, 15:292
— *rubrinervis* Lévl. = Rhamnella rubrinervis (Lévl.) Rehd. 15:12; 18:219
— *rubro-violacea* Lévl. = Ilex purpurea Hassk. 14:239
— *Schlechteri* Lévl. = E. pauciflora Diels, 15:291
— *Valbrayi* Lévl. = Schisandra propinqua Hook. f. & Thoms. var. sinensis Oliver, 10:191
— *Vaniotii* Lévl. = Gaultheria yunnanensis (Franch.) Rehd. 15:282
Engelhardtia *Esquirolii* Lévl. = E. Colebrookiana Lindl. in Wall. 10:118
Enkianthus *Cavaleriei* Lévl. = E. Dunnii Lévl. 15:278; 18:230
— *cerasiflora* (Lévl.) Lévl. = E. chinensis Franch. 15:279; 18:230
— Dunnii Lévl. 15:278; 18:230
— *xanthoxantha* Lévl. = E. Dunnii Lévl. 15:278; 18:230
Epimedium Cavaleriei Lévl. = Stauntonia Cavalerieana Gagnep. 17:320
Eriolaena *Esquirolii* Lévl. = Burretiodendron Esquirolii (Lévl.) Rehd. 17:48, pl. 178; 18:220
— *sterculiacea* (Lévl.) = E. malvacea (Lévl.) Hand.-Mazz. 15:95
Erythrina Mairei Lévl. = Dumasia villosa DC. 13:330
Erythrospermum Cavaleriei Lévl. = Celastrus Hindsii Benth. var. Henryi Loes. 14:250
Esquirolia sinensis Lévl. = Ligustrum lucidum Ait. 15:304
Eucommia *ulmoidea* Oliv. var. *yunnanensis* Lévl. = E. ulmoides Oliv. 17:333

Eugenia Esquirolii Lévl. = Decaspermum fruticosum Forst. 15:109
Eurya Cavaleriei Lévl. = Symplocos laurina (Retz.) Wall. 15:298
— *Esquirolii* Lévl. [= *Neolitsea spec.* 10:193 = Litsea *Esquirolii* (Lévl.) Allen, 17:329, non Lévl.] = L. **Kobuskiana** Allen, nom. nov.
Evodia Chaffanjoni Lévl. = Euscaphis japonica (Thbg.) Dipp. 15:2
— *Lyi* Lévl. = Miliusa sinensis Fin. & Gagnep. 10:191
— *odorata* Lévl. [= Zanthoxylum *odoratum* (Lévl.) Lévl. 14:224] = Z. rhetsoides Drake, 18:209
Evonymus *acanthocarpa* Lévl. non Franch. = E. aculeata Hemsl. 14:246
— *bicolor* Lévl. = E. Rehderiana Loes. 14:245
— *Blinii* Lévl. p. p. = E. uniflora Lévl. & Vant. 14:243
— *Blinii* Lévl. p. p. = E. theaefolia Wall. ex M. A. Laws. in Hook. f. 14:244
— *Blinii* Lévl. p. p. = E. Forbesiana Loes. 14:246
— *Blinii* Lévl. p. p. = E. subtrinervis Rehd. 14:247
— *Bodinieri* Lévl. = E. lanceifolia Loes. 14:248
— *Cavaleriei* Lévl. p. p. = E. Dielsiana Loes var. latifolia Loes. 14:245
— *Cavaleriei* Lévl. p. p. = E. subtrinervis Rehd. 14:247
— centidens Lévl. 14:244; 18:215
— *coreanus* Lévl. = E. Maackii Rupr. 14:248
— *Crosnieri* Lévl. = E. Forbesiana Loes. 14:246
— *Darrisii* Lévl. = E. Hamiltoniana Wall. 14:248
— *Dielsiana* "Loes." ex Lévl., non Loes. = E. Dielsiana Loes. var. latifolia Loes. 14:245
— disticha Lévl. 14:249
— *erythrocarpa* (Lévl.) Lévl. = E. acanthocarpa Franch. 14:246
— Esquirolii Lévl. 14:244
— Feddei Lévl. 14:245
— *hypoleucus* Lévl. = Mallotus philippinensis (Lam.) Muell. Arg. 14:233
— Leclerei Lévl. 14:244
— *Maackii* "Rupr." ex Lévl., non Rupr. = E. Hamiltoniana Wall. 14:248
— *Mairei* Lévl. p. p. = E. grandiflora Wall. 14:242
— *Mairei* Lévl. p. p. = E. yunnanensis Franch. 14:243
— *proteus* Lévl. = E. Rehderiana Loes. 14:245
— *provicarii* Lévl. = Pittosporum truncatum E. Pritz. 12:280
— *rugosa* Lévl. = E. Hamiltoniana Wall. 14:248
— uniflora Lévl. & Vant. 14:243
— *Vanioti* Lévl. = E. Forbesiana Loes. 14:246
— *yunnanensis* Lévl. = Gymnosporia acuminata Hook. f. 14:251

Fatsia Cavaleriei Lévl. = Trevisia palmata (Roxb.) Vis. 15:113
Ficus *acanthocarpa* Lévl. & Vant. = F. clavata Wall. ex Miq. 10:124
— *asymetrica* Lévl. & Vant. 10:128 = F. obscura Bl. 17:74
— *Blinii* Lévl. & Vant. [= F. *suberosa* Lévl. & Vant. 10:131] = F. glaberrima Bl. 17:73
— *Bodinieri* Lévl. & Vant. = F. impressa Champ. ex Benth. 10:125
— *Bonatiana* Lévl. = F. tikoua Bur. 17:76
— *Bonatii* Lévl. = F. Tikoua Bur. 17:76
— *botryoides* Lévl. & Vant. 10:128 = F. Martini Lévl. & Vant. 17:75
— *cantoniensis* Bodinier ex Lévl. = F. scandens Roxb. 17:75
— Cavaleriei Lévl. & Vant. 10:128; 17:78
— *Chaffanjoni* Lévl. & Vant. = F. foveolata Wall ex Miq. 10:124
— *congesta* Lévl. & Vant. in Lévl. 10:128 = F. silhetensis Miq. 17:80
— *corymbifera* Lévl. & Vant. = Solanum verbascifolium L. 18:245
— *cuneata* Lévl. & Vant. 10:128, p. p. = F. heteromorpha Hemsl. 17:77
— — var. *congesta* Lévl. & Vant. 10:129, sub F. cuneata
— *cuneata* Lévl. & Vant. 10:128, p. p. = F. pandurata Hance, 17:77
— *Cyanus* Lévl. & Vant. 10:129 = F. silhetensis Miq. 17:80
— — var. *viridescens* Lévl. & Vant. = F. silhetensis Miq. 17:80
— *Duclouxii* Lévl. & Vant. = F. foveolata Wall. ex Miq. 10:124
— *Esquiroliana* Lévl. = F. hirta var. Roxburghii (Miq.) King, 10:127
— Esquirolii Lévl. & Vant. 17:79; 18:256
— *Fauriei* Lévl. & Vant. = F. foveolata var. Thunbergii (Maxim.) King, 10:125
— — var. *macrocarpa* Lévl. = F. foveolata var. Thunbergii (Maxim.) King, 17:75
— *fecundissima* Lévl. & Vant. = F. lacor Ham. 10:124
— *Feddei* Lévl. & Vant. = F. glaberrima Bl. 17:73
— *Fortunati* Lévl. & Vant. = F. foveolata Wall. ex Miq. 10:124
— *hederifolia* Lévl. 10:129 = F. foveolata var. Thunbergii (Maxim.) King, 17:75
— *hirtaeformis* Lévl. & Vant. [= Actinidia *lanata* Hemsl. 15:97] = A. eriantha Benth. 18:222
— hypoleucogramma Lévl. & Vant. 10:129
— Jamini Lévl. & Vant. 10:129; 17:75
— *Kingiana* Lévl. p. p. non Hemsl. 10:129 = F. glaberrima Bl. 17:73
— *Kingiana* Lévl. p. p. non Hemsl. 10:129 = F. pyriformis Hook. & Arn. 17:79
— *Kouytchense* Lévl. & Vant. = F. heteromorpha Hemsl. 10:126
— laceratifolia Lévl. & Vant. 10:130; 17:78
— *lacrymans* Lévl. 10:130 = F. Martini Lévl. & Vant. 17:75

Ficus *lageniformis* Lévl. & Vant. = F. formosana Maxim. 10:127
— *laus-Esquirolii* Lévl. p. p. = F. hirta Vahl, 10:126
— *laus-Esquirolii* Lévl. p. p. = F. hirta var. Roxburghii (Miq.) King, 10:127
— Letaqui Lévl. & Vant. 10:130; 17:82
— longepedata Lévl. & Vant. 10:127; 17:74
— *longepedata* Lévl. & Vant. ex Lévl. p. p. = F. gibbosa Bl. var. cuspidifera King, 10:123
— *macrocarpa* "Wight" ex Lévl. & Vant., non Wight, 10:130 = F. Roxburghii Wall. ex Miq. 17:81
— *macropodocarpa* Lévl. & Vant. 10:130 = F. pyriformis Hook. & Arn. var. ischnopoda King, 17:79
— *Mairei* Lévl. = F. heteromorpha Hemsl. 10:126; 17:76, sub *F. erecta* Thunb.
— *Marchandii* Lévl. = Capparis viminea Hook. f. & Th. ex Hook. 17:332
— Martini Lévl. & Vant. 10:127; 17:75; 18:256
— *Michelii* Lévl. = F. gibbosa Bl. var. cuspidifera King, 10:123
— *neo-Esquirolii* Lévl. = F. hirta var. Roxburghii (Miq.) King, 10:127
— *Nerium* Lévl. & Vant. 10:130 = F. pyriformis Hook. & Arn. 17:79
— orthoneura Lévl. & Vant. 10:130
— *Ouangliense* Lévl. = Aglaia tetrapetala (Pierre) Pellegr. 18:210
— *pandurata* Lévl. & Vant. ex Lévl. = F. heteromorpha Hemsl. 10:126
— *pinfaensis* Lévl. & Vant. = F. heteromorpha Hemsl. 10:126
— *Porteri* Lévl. & Vant. = F. hirta Vahl, 10:126; 17:77
— pseudobotryoides Lévl. & Vant. 10:131
— *pseudo-piriformis* Lévl. & Vant. [= *F. erecta* Thunb. 10:125] = F. erecta Thunb. var. Sieboldi (Miq.) King, 17:77
— *pseudo-religiosa* Lévl. = F. lacor Ham. 10:124
— *retusiformis* Lévl. 10:131 = F. retusa L. 17:74
— *rhomboidalis* Lévl. 10:131 = F. formosana Maxim. 17:78
— *rhomboidalis* Lévl. & Vant. = F. gibbosa Bl. var. cuspidifera King, 10:123; 17:73
— *rufipes* Lévl. & Vant. p. p. = F. foveolata Wall. ex Miq. 10:124; 17:75; 18:255
— *rufipes* Lévl. & Vant. p. p. = Psychotria Prainii Lévl. 18:248
— *Salix* Lévl. = Salix babylonica L. 10:115
— *sambucixylon* Lévl. = F. hispida L. f. 10:126
— *Schinzii* Lévl. & Vant. 10:131 = F. Abelii Miq. 17:81
— *Seguinii* Lévl. = F. foveolata Wall. ex Miq. 10:124
— Stapfii Lévl. 10:131; 17:81

Ficus *suberosa* Lévl. & Vant. 10:131 = F. glaberrima Bl. 17:73
— *Taqueti* Lévl. & Vant. = F. erecta Thunb. 10:125; 17:76
— *Tenii* Lévl. = F. lacor Ham. 10:124; 17:74
— *trichopoda* Lévl. = F. longepedata Lévl. & Vant. 10:127
— *Vanioti* Lévl. (1909) = Aglaia tetrapetala (Pierre) Pellegr. 18:210
— Vanioti Lévl. (1915, p. p.) 17:82; 18:256
Flacourtia Cavaleriei Lévl. = Xylosma racemosum var. kwangtungense (Metcalf) Rehd. 15:102
Fontanesia *Argyi* Lévl. = Fontanesia Fortunei Carr. 15:302
Fordiophyton Cavaleriei var. *violacea* Lévl. = Bredia Cavaleriei (Lévl.) Diels, 15:112
Fraxinus Fauriei Lévl. = Meliosma Oldhamii Miq. 15:302, in nota; 18:217
Gardenia *Schlechteri* Lévl. = G. jasminoides Ellis, 16:321
Gaultheria crenulata "Kurz" ex Lévl., non Kurz, in herb. = Viburnum Schneiderianum Hand.-Mazz. 16:331
Glochidion *Bodinieri* Lévl. = Glochidion puberum (L.) Hutchins. 14:231
— *Cavaleriei* Lévl. = Illicium Griffithii Hook. f. & Th. 17:323
— *Esquirolii* Lévl. = G. villicaule Hook. f. 14:231
— *Vanioti* Lévl. = Orixa japonica Thunb. 14:224
Gnetum Cavaleriei Lévl. 17:56 verisimiliter ad Anacardiaceas pertinet
Gongronema yunnanense Lévl. [= *Marsdenia yunnanensis* (Lévl.) Woods. 15:317] = Marsdenia oreophila W. W. Sm. 18:242
Grewia *Chanetii* Lévl. = G. biloba G. Don var. parviflora (Bge.) Hand.-Mazz. 15:93
— *Esquirolii* Lévl. [= G. *biloba* G. Don, 15:92] = G. Henryi Burret, 18:221
Gymnosporia Esquirolii (Lévl.) Lévl. 14:250
Hedyotis Bodinieri Lévl. = Oldenlandia Bodinieri (Lévl.) Chun, 16:316
— *Esquirolii* Lévl. [= *Oldenlandia macrostemon* (Hook. & Arn.) Ktze. 16:316] = Oldenlandia hedyotidea (DC.) Hand.-Mazz. 18:247
— *Mairei* Lévl. = Viburnum congestum Rehd. 16:329
— *yunnanensis* Lévl. = Viburnum foetidum Wall. var. rectangulatum (Graebn.) Rehd. 16:331
Helicteres *Cavaleriei* Lévl. = H. glabriuscula Wall. 15:96
Helwingia Argyi Lévl. & Vant. = Stemona japonica (Bl.) Miq. 17:57
Heptapleurum Bodinieri Lévl. = Schefflera Bodinieri (Lévl.) Rehd. 15:114
— *Cavaleriei* Lévl. = Schefflera elliptica (Bl.) Harms, 15:114
— *Dunnianum* Lévl. = Schefflera Delavayi (Franch.) Harms, 15:113

Heptapleurum Esquirolii Lévl. = Nothopanax Delavayi (Franch.) Harms, 15:115
— *tripteris* Lévl. = Brassaiopsis tripteris (Lévl.) Rehd. 15:115
Hernandia sinensis Lévl. = Iodes ovalis Bl. 15:2
Heterosmilax *Gaudichaudiana* var. *latifolia* Bodinier ex Lévl. = Heterosmilax Gaudichaudiana (Kunth) Maxim. 17:64
Hibiscus *bellicosus* Lévl. = H. sagittifolius Kurz var. septentrionalis Gagnep. 15:95
— *Bodinieri* Lévl. = H. crinitus (Wall.) G. Don, 15:94
— *Bodinieri* var. *brevicalyculata* Lévl. = H. sagittifolius Kurz var. septentrionalis Gagnep. 15:95
— *Cavaleriei* Lévl. = H. crinitus (Wall.) G. Don, 15:94
— *Esquirolii* Lévl. = H. sagittifolius Kurz var. septentrionalis Gagnep. 15:95
— Labordei Lévl. 15:94
Hiptage Cavaleriei Lévl. = Eriobotrya Cavaleriei (Lévl.) Rehd. 13:307; 17:334
— *Esquirolii* Lévl. = Photinia Bodinieri Lévl. 13:307
Hoya *Cavaleriei* Lévl. = Holboellia latifolia Wall. 17:321
— *Esquirolii* Lévl. 15:318 = Dischidia Esquirolii (Lévl.) Tsiang, 18:241
— *Lyi* Lévl. [= *H. carnosa* "R. Br." ex Woods., non R. Br. 15:318] 18:241
Hoyopsis Dielsii Lévl. = Tylophora Dielsii (Lévl.) Hu, 18:241
Hydrangea *Arbostiana* Lévl. = H. Davidii Franch. 12:276
— *Davidii* Franch. var. *Arbostiana* Lévl. = H. Davidii Franch., 12:276
— *Kamienskii* Lévl. = H. paniculata Sieb. 12:277
— *Maximowiczii* Lévl. = H. Rosthornii Diels, 12:277
— *sachalinensis* Lévl. = H. paniculata Sieb. 12:277
— *Taquetii* Lévl. = Schizophragma hydrangeoides Sieb. & Zucc. 12:278
— *tiliaefolia* Lévl. = H. petiolaris Sieb. & Zucc. 12:278
— *villosa* Rehd. var. *Mairei* Lévl. = H. strigosa Rehd. 12:277
Hypericum *Argyi* Lévl. & Vant. = H. patulum Thunb. 15:100
— *Bodinieri* Lévl. = H. napaulense Choisy, 18:225
— *Dielsii* Lévl. = H. otaruense R. Keller, 18:224
— *erectum* Thunb. var. *axillare* Lévl. = H. erectum Thunb. 18:224
— *Henryi* Lévl. & Vant. = H. Hookerianum Wight & Arn. 15:100
— kouytchense Lévl. 10:134; 15:101
— longifolium Lévl. 15:101, 377
— *Matsumurae* Lévl. = H. erectum Thunb. 18:224
— *Vanioti* Lévl. p. p. = H. erectum Thunb. 18:224
— *Vanioti* Lévl. p. p. = H. otaruense R. Keller, 18:224
Ilex corallina Franch. var. Loeseneri Lévl. 14:242

Ilex *Dunniana* Lévl. = I. corallina Franch. 14:241
— *Fargesii* Franch. var. *Bodinieri* Loes. in Lévl. = I. metabaptista Loes. var. myrsinoides (Lévl.) Rehd. 14:240
— *metabaptista* "Loes." ex Lévl., vix Loes. = I. metabaptista Loes. var. myrsinoides (Lévl.) Rehd. 14:240
— *myrsinoides* (Lévl.) Merr. = I. metabaptista Loes. var. myrsinoides (Lévl.) Rehd. 14:241, in nota.
— *purpurea* var. *Leveilleana* Loes. in Lévl. = I. pedunculosa Miq. var. continentalis Loes. 14:240
Illigera Dunniana Lévl. 18:256
Illicium *Cavaleriei* (Lévl.) Lévl. = I. Griffithii Hook. f. & Th. 17:323
Incarvillea Argyi Lévl. = Quamoclit pennata (Desrouss.) Bojer, 18:242
Indigofera *Bodinieri* Lévl. = I. stachyodes Lindl. 13:323
— *Cavaleriei* Lévl. = I. atropurpurea Buch.-Ham. ex Roxb. 13:325
— *Craibiana* Lévl. = I. reticulata Franch. 13:325
— *Dosua* Buch.-Ham. var. *stachyodes* (Lindl.) Lévl. = I. stachyodes Lindl. 13:323
— Esquirolii Lévl. 13:324; 18:207
— *Mairei* Lévl. = Sophora glauca DC. 13:323
— *Thirionni* Lévl. = Derris spec. Lévl. 13:330
— Vanioti Lévl. p. p. 13:324
— *Vanioti* Lévl. p. p. = I. szechuensis Craib, 13:325
Itea *Bodinieri* Lévl. = I. yunnanensis Franch. 12:279
— *Esquirolii* Lévl. = I. yunnanensis Franch. 12:279
Ixora Henryi Lévl. 16:322; 18:248
Jasminum *Argyi* Lévl. = J. floridum Bge. 15:306
— *Blinii* Lévl. = J. polyanthum Franch. 15:307
— *Bodinieri* Lévl. = J. sinense Hemsl. 15:306
— *Delafieldii* Lévl. = J. polyanthum Franch. 15:307
— *Dunnianum* Lévl. = J. lanceolarium Roxb. var. puberulum Hemsl. 15:306
— *Esquirolii* Lévl. = J. multiflorum (Burm. f.) Andr. 15:308
— *laurifolium* var. *villosum* Lévl. = J. amplexicaule Buch.-Ham. 15:308
— *Mairei* Lévl. = J. humile L. 15:306
— — var. *siderophyllum* Lévl. = J. humile L. 15:306
— Prainii Lévl. 15:308; 18:234
— *Schneideri* Lévl. = J. Duclouxii (Lévl.) Rehd. 15:307
— Seguini Lévl. 15:307; 18:233
— *Valbrayi* Lévl. = J. Beesianum Forr. & Diels, 15:308
Juniperus *Franchetiana* Lévl. = J. squamata Lamb. 17:56
— *Lemeeana* Lévl. & Blin = J. squamata Lamb. var. Fargesii (Komar.) Rehd. & Wils. 17:56

Juniperus *Mairei* Lemée & Lévl. = J. formosana Hayata, 10:110
Kadsura *Cavaleriei* Lévl. = K. chinensis Hance, 10:190
Keteleeria *Esquirolii* Lévl. = K. Davidiana (Bertr.) Beiss. 10:109; 18:254
Lasianthus *Dunniana* Lévl. = L. Hookeri Clarke, 16:323
— *Esquirolii* Lévl. = L. Biermanni King, 16:323
Leea Dielsii Lévl. = Ampelopsis Chaffanjoni (Lévl.) Rehd. 15:25
— *theifera* Lévl. = Ampelopsis cantoniensis (Hook. & Arn.) Planch. 15:26
Leptodermis *Chaneti* Lévl. = L. oblonga Bge. 16:328
— *Esquirolii* Lévl. = L. Potanini Batal. 16:326
— *Mairei* Lévl. (1914) = L. pilosa (Fr.) Diels var. glabrescens Winkl. 16:327
— *Mairei* Lévl. in herb. = Wendlandia longidens (Hance) Hutchins. 16:318
— *motsouensis* Lévl. = L. Potanini Bat. var. glauca (Diels) H. Winkl. 16:327
— *tongchouanensis* Lévl. = L. Potanini var. tomentosa H. Winkl. 16:327
Lespedeza *Blinii* Lévl. = Campylotropis polyantha (Franch.) Schindl. 13:329
— *dichromocalyx* (errore) = *L. dichromoxylon* Lévl.
— *dichromoxylon* Lévl. = Campylotropis polyantha (Franch.) Schindl. 13:329; 18:276
— *Fauriei* Lévl. = L. daurica (Laxm.) Schindl. 13:328
— *Monnoyeri* Lévl. 13:328 = L. fasciculiflora Franch. 18:207
— *Pampaninii* Lévl. = L. Forrestii Schindl. 13:326
Lettsomia Seguini Lévl. = Argyreia Seguini (Lévl.) Vaniot ex Lévl. 15:319; 18:242
Leucosceptrum *Bodinieri* Lévl. = L. chinense Hemsl. 16:311
Ligustrum *Argyi* Lévl. = L. Quihoui Carr. 15:305
— *Bodinieri* Lévl. = L. sinense Lour. var. myrianthum (Diels) Hoefker, 15:305
— *Esquirolii* Lévl. = L. lucidum Ait. 15:304
— *lucidum* var. *Esquirolii* Lévl. = L. lucidum Ait. 15:304
— *Mairei* Lévl. = Syringa Mairei (Lévl.) Rehd. 15:302
— *phillyrea* Lévl. = Osmanthus Delavayi Franch. 15:303
— *Taquetii* Lévl. = L. japonicum Thunb. 15:305
— *Thea* Lévl. = Wendlandia salicifolia Franch. 16:317
— *Vanioti* Lévl. = Fraxinus Griffithii C. B. Clarke, 15:302
Lindera *Bodinieri* Lévl. [= *Benzoin commune* (Hemsl.) Rehd. 10:194; 17:330] = L. communis Hemsl. 18:275

Lindera *camphorata* Lévl. = Sassafras Tzumu Hemsl. 17:328
— *Cavaleriei* Lévl. = Notaphoebe omeiensis (Gamble) Chun, 10:192; 17:327
— *Dielsii* Lévl. = Litsea Cubeba Pers. 10:194
— *Esquirolii* Lévl. = Litsea spec. 17:330
— *yunnanensis* Lévl. [= *Benzoin commune* (Hemsl.) Rehd. 10:194] = L. communis Hemsl. 18:275
— *spec.* Lévl. = Bridelia spec. 18:213
Litsaea see Litsea
Litsea *Cavaleriei* Lévl. [= *Benzoin commune* (Hemsl.) Rehd. 10:194] = Lindera communis Hemsl. 18:275
— *Chaffanjoni* Lévl. = Symplocos stellaris Brand, 15:301
— *coreana* Lévl. = Machilus Thunbergii Sieb. & Zucc. 17:327
— *Dielsii* Lévl. = L. Cubeba Pers. 10:194
— *Dunniana* Lévl. [= *Neolitsea spec.* 10:193] = L. Dunniana Lévl. 17:329
— *Esquirolii* Lévl. [= *Benzoin commune* (Hemsl.) Rehd. 10:194] = Lindera communis Hemsl. 18:275
— *Mairei* Lévl. = Myrica adenophora Hance, 17:66
— *myricopsis* Lévl. = Myrica esculenta Ham. ex Don, 17:66
— *touyunensis* Lévl. 10:194 [= *Benzoin touyunense* (Lévl.) Rehd. 17:331] = Lindera megaphylla Hemsl. f. touyunensis (Lévl.) Rehd. 18:275
— *undulatifolia* Lévl. 10:193 = Neolitsea undulatifolia (Lévl.) Allen, 17:328
Lonicera *acrophila* Lévl. = L. lanceolata Wall. 16:337
— *androsaemifolia* Lévl. = Woodfordia fruticosa (L.) S. Kurz, 15:107
— *buxifolia* Lévl. = L. pileata Oliv. 16:336
— *Cavaleriei* Lévl. = Jasminum sinense Hemsl. 15:306
— Esquirolii Lévl. 16:339
— *Fauriei* Lévl. & Vant. = L. japonica Thbg. 16:339
— fragilis Lévl. 16:337
— *Guilloni* Lévl. = L. macrantha Spreng. 16:338
— *gynopogon* Lévl. = L. Koehneana Rehd. 16:338
— *Mairei* Lévl. = L. yunnanensis Franch. 16:339
— *Menelii* Lévl. = Phlogacanthus pubinervis T. Anders. 16:315
— *missionis* Lévl. p. p. = L. ligustrina Wall. 16:335
— *missionis* Lévl. p. p. = L. pileata Oliv. 16:336
— Pampaninii Lévl. 16:338; 18:250, 361
— *Rehderi* Lévl. = Jasminum sinense Hemsl. 15:306
— *Rocheri* Lévl. = L. tangutica Maxim. 16:335

Lonicera *Vaccinium* Lévl. = Wikstroemia Vaccinium (Lévl.) Rehd. 15:103
Loranthus Esquirolii Lévl. = Tolypanthus Maclurei (Merr.) Danser, 17:82
Luculia gratissima "Sw." ex Lévl., non Sweet = Wendlandia ligustrina Wall. 16:317
Lysimachia Mairei Lévl. = Paradombeya sinensis Dunn, 18:222
Lysionotus *Cavaleriei* Lévl. = L. pauciflorus Maxim. var. linearis Rehd. 18:246
Machilus *camphoratus* Lévl. = Alseodaphne camphorata (Lévl.) Allen, 17:326
— Cavaleriei Lévl. 10:192; 17:326
— *Dominii* Lévl. = Cinnamomum glanduliferum Meissn. 10:192
— *Dunnianus* Lévl. = Notaphoebe omeiensis (Gamble) Chun, 10:192; 17:327
— *Mairei* Lévl. = Notaphoebe omeiensis (Gamble) Chun, 10:192; 17:327
— *oreophila* "Hance" ex Lévl., non Hance = M. longipedicellata Lecte. 17:326
— *Thunbergii* "Sieb. & Zucc." ex Lévl., non Sieb. & Zucc. = M. Rehderi Allen, 17:326
Maesa *aurea* Lévl. = Symplocos Bodinieri Brand, 15:299
— *Blinii* Lévl. = Rhamnus Blinii (Lévl.) Rehd. 15:15
— *Bodinieri* Lévl. & Blin = Symplocos laurina (Retz.) Wall. 15:298
— *Cavaleriei* Lévl. = M. japonica (Thbg.) Moritzi ex Zoll. 15:288
— *Dunniana* Lévl. = M. japonica (Thbg.) Moritzi ex Zoll. 15:288
— *Esquirolii* Lévl. = M. japonica (Thbg.) Moritzi ex Zoll. 15:288
— *Labordei* Lévl. = M. japonica (Thbg.) Moritzi ex Zoll. 15:288
— *Martini* Lévl. = M. tenera Mez, 15:288
— *myrsinoides* Lévl. = Ilex metabaptista Loes. var. myrsinoides (Lévl.) Rehd. 14:240
— *scandens* Lévl. = Trachelospermum axillare Hook. f. 15:310; 18:237, 361
— *singuliflora* Lévl. = Quercus phillyreoides Gray, 10:121
— *spec.* Lévl. = Sarcococca Hookeriana Baill. var. humilis Rehd. & Wils. 14:235
Magnolia Martini Lévl. = Michelia Martini (Lévl.) Fin. & Gagnep. ex Lévl. 10:190
Mahonia *elegans* Lévl. pro synon. = M. elegans (Lévl.) Rehd. 17:322
Mallotus *Cavaleriei* Lévl. = Discocleidion rufescens (Franch.) Pax & Hoffm. 14:234
— Esquirolii Lévl. (no. 562) 14:232; 18:213

Mallotus *Esquirolii* Lévl. (no. 691) = M. Leveillanus Fedde, 14:232
— *Leveillei* Fedde ex Lévl. = M. Leveilleanus Fedde, 14:232
— Milliettii Lévl. 14:233
— *neo-Cavaleriei* Lévl. = Deeringia amaranthoides (Lam.) Merr. 10:185
Marlea Bodinieri Lévl. = Alangium Faberi Oliver, 15:108
— *Cavaleriei* Lévl. = Gardneria multiflora Mak. 15:309
Melastoma *Cavaleriei* Lévl. = M. normale D. Don, 15:109
— *Esquirolii* Lévl. = M. normale D. Don, 15:109
— *Mairei* Lévl. = Osbeckia crinita Benth. in Wall. ex Clarke, 15:109
Meliosma ? Cavaleriei Lévl. = Ampelopsis Chaffanjoni (Lévl.) Rehd. 15:25
Melodinus *Bodinieri* Lévl. = Trachelospermum Bodinieri (Lévl.) Woods. 15:312; 18:237, 361
— *Cavaleriei* Lévl. p. p. = Trachelospermum Dunnii (Lévl.) Lévl. 18:237, 361
— *Cavaleriei* Lévl. p. p. = Trachelospermum gracilipes Hook. f. 15:311; 18:236
— *Chaffanjoni* Lévl. = Trachelospermum axillare Hook. f. 15:310; 18:237, 361
— *Duclouxii* Lévl. = Jasminum Duclouxii (Lévl.) Rehd. 15:307
— *Dunnii* Lévl. = Trachelospermum Dunnii (Lévl.) Lévl. 15:311; 18:237, 361
— *edulis* Lévl. = M. Seguini Lévl. 15:313; 18:235
— *Esquirolii* Lévl. = M. Seguini Lévl. 15:313; 18:235
— *flavus* Lévl. = M. Seguini Lévl. 15:313; 18:235
— Seguini Lévl. 15:313; 18:235
Melodium Dunnii Lévl. = Trachelospermum Dunnii (Lévl.) Lévl. 15:311; 18:237, 361
Melodorum retusum Lévl. = Fissistigma retusum (Lévl.) Rehd. 10:191
Mercurialis acanthocarpa Lévl. = Speranskia cantonensis (Hance) Pax & Hoffm. 14:232
Mespilus Esquirolii Lévl. [= Actinidia *lanata* Hemsl. 15:97] = A. eriantha Benth. 18:222
Metaplexis Cavaleriei Lévl. [= *Marsdenia Cavaleriei* (Lévl.) Hand.-Mazz. ex Woods. 15:318] = Marsdenia tenacissima (Roxb.) Wight & Arn. 18:242
Michelia *Cavaleriei* Lévl., non Fin. & Gagnep. = M. Leveilleana Dandy, 10:190
Microrhamnus Bodinieri Lévl. = Nyssa sinensis Oliver, 15:107
— *Cavaleriei* Lévl. = Rhamnella Martini (Lévl.) Schneid. 15:11, 377

Microrhamnus Franchetiana Lévl. p. p. = Tripterygium hypoglaucum (Lévl.) Hutchins. 15:1
— *Franchetiana* Lévl. p. p. = Berchemia Giraldiana Schneid. 15:10
— *Mairei* Lévl. p. p. = Berchemia Giraldiana Schneid. 15:10
— *Mairei* Lévl. p. p. = Berchemia pycnantha Schneid. 15:11
— *Taquetii* Lévl. = Evonymus alata (Thbg.) Reg. 14:249
Microtoena *Esquirolii* Lévl. = M. insuavis (Hance) Prain ex Dunn, 18:244
— *mollis* Lévl. = M. insuavis (Hance) Prain ex Dunn, 18:244
Millettia *Blinii* Lévl. = M. Dielsiana Harms, 13:326
— *Bodinieri* Lévl. = M. Dielsiana Harms, 13:326
— *Cavaleriei* Lévl. = Campylotropis velutina (Dunn) Schindl. 13:329
— *Dunniana* Lévl. = M. Dielsiana Harms, 13:326
— *Esquirolii* Lévl. 13:326, in nota = Sophora spec. 18:207
— *fragrantissima* Lévl. = M. Dielsiana Harms, 13:326
— Gentiliana Lévl. 13:326
Morinda Esquirolii Lévl. = Macaranga Esquirolii (Lévl.) Rehd. 18:214
Morus *calva* Lévl. = Coriaria sinica Maxim. 14:237
— *Cavaleriei* Lévl. = M. australis Poir. 10:123
— *integrifolia* Lévl. & Vant. [= Vanieria tricuspidata (Carr.) Hu, 17:72] = Cudrania tricuspidata (Carr.) Bureau, 18:275
— *inusitata* Lévl. = M. australis Poir. 10:123
— *Mairei* Lévl. = Acalypha Mairei (Lévl.) Schneid. 14:234
Mucuna *Bodinieri* Lévl. 13:330 = M. Birdwoodiana Tutch. 18:208
— Esquirolii Lévl. 13:331
— *Mairei* Lévl. = M. sempervirens Hemsl. 13:331
— *Martini* Lévl. = M. cochinchinensis (Lour.) A. Cheval. 13:331
— terrens Lévl. 13:330
Mussaenda *Bodinieri* Lévl. = M. pubescens Ait. f. 16:320
— *Cavaleriei* Lévl. = Emmenopterys Henryi Oliv. 16:318
— Esquirolii Lévl. 16:319; 18:248
— *Mairei* Lévl. = Emmenopterys Henryi Oliv. 16:318
Myrica Cavaleriei Lévl. p. p. = Castanopsis spec. 17:71
— *Cavaleriei* Lévl. p. p. = Quercus spec. 10:122; 17:72
— *Darrisii* Lévl. = Antidesma microphyllum Hemsl. 14:232
— *Esquirolii* Lévl. = Podocarpus neriifolia D. Don, 10:108
— *Mairei* Lévl. = Vaccinium pubicalyx Franch. 15:285
— *rapaneoidea* Lévl. = Distylium chinense (Franch.) Diels, 17:333
— *Seguini* Lévl. = Distylium chinense (Franch.) Diels, 12:280; 17:333
Myrsine Chaffanjoni Lévl. = Microtropis fokienensis Dunn, 18:216
— *Chevalieri* Lévl. = Sarcococca Hookeriana Baill. var. humilis Rehd. & Wils. 14:235

Myrsine Esquirolii Lévl. = Maesa japonica (Thbg.) Moritzi ex Zoll. 15:288
— *Feddei* Lévl. = Ilex metabaptista Loes. var. myrsinoides (Lévl.) Rehd. 14:240
— *Seguini* Lévl. = Rapanea neriifolia (S. & Z.) Mez, 15:293
Neillia glandulocalyx Lévl. [= *N. sinensis* Oliv. f. *glanduligera* (Hemsl.) Rehd. 13:299] = Neillia sinensis Oliv. 17:334
Ophiorrhiza *Cavaleriei* Lévl. = O. japonica Bl. 16:316
— *Esquirolii* Lévl. = Jasminum Prainii Lévl. 18:234
— *Labordei* Lévl. = O. japonica Bl. 16:316
— *Seguini* Lévl. = O. cantoniensis Hance, 16:316
— *violaceo-flammea* Lévl. = O. cantoniensis Hance, 16:316
Ormosia Esquirolii Lévl. = Sophora japonica L. 13:322
Oxyspora Cavaleriei Lévl. = Fordiophyton Faberi Stapf, 15:112
— *Cavaleriei* Lévl. = Phyllagathis Cavaleriei (Lévl. & Vant.) Guillaumin, 15:113; 18:227, 361
Pachysandra *axillaris* Franch. var. *Kouytchensis* Lévl. = P. stylosa Dunn, 14:235
— *Bodinieri* Lévl. = P. stylosa Dunn, 14:235
— *Mairei* Lévl. = Sarcococca Hookeriana Baill. var. humilis Rehd. & Wils. 14:235
Paederia *Bodinieri* Lévl. (1914) = Gardneria multiflora Mak. 15:309
— *Bodinieri* Lévl. (1915) [= *P. Wallichii* Hook. f. 16:325] = P. yunnanensis (Lévl.) Rehd. 18:249
— Cavaleriei Lévl. 16:326; 18:249
— *Dunniana* Lévl. = P. scandens (Lour.) Merr. 16:324; 18:249
— *Esquirolii* Lévl. = P. scandens (Lour.) Merr. 16:324; 18:249
— *Mairei* Lévl. = P. scandens (Lour.) Merr. 16:324; 18:249
— — *tomentosa* "Bl." ex Lévl., non Bl. = P. Cavaleriei Lévl. 16:326
— var. *Mairei* (Lévl.) Lévl. = P. scandens (Lour.) Merr. 16:324
— — var. *purpureo-coerulea* Lévl. & Vant. = [*P. Wallichii* Hook. f. 16:325] = P. yunnanensis (Lévl.) Rehd. 18:249
Paliurus Mairei Lévl. = Zizyphus mauritiana Lam. 15:10
Parameria Esquirolii Lévl. [= *Sindechites Esquirolii* (Lévl.) Woods., 15:316] = S. Henryi Oliv. 18:238
Passiflora Seguini Lévl. & Vant. 18:225
Pavetta Esquirolii Lévl. = Clerodendron Bungei Steud. 15:324
Pentace Esquirolii Lévl. = Burretiodendron Esquirolii (Lévl.) Rehd. 17:48, pl. 178; 18:220
— *Virginis* Lévl. = Tripterygium hypoglaucum (Lévl.) Hutchins. 14:252
Pentasacme Esquirolii Lévl. = Heterostemma Esquirolii (Lévl.) Tsiang, 18:242

Periploca astacus Lévl. = Trachelospermum axillare Hook. f. 15:310; 18:237, 361
Pertya Bodinieri Vaniot, 16:340
Philadelphus *coronarius* var. *chinensis* Lévl. = P. Magdalenae Koehne, 12:275
Photinia Bodinieri Lévl. 13:307
— *Cavaleriei* Lévl. (1907) = P. Beauverdiana Schneider, 13:305
— *Cavaleriei* (1912) = P. crassifolia Lévl. 13:306
— crassifolia Lévl. 13:306
— Mairei Lévl., 13:307
— *rosifoliolata* Lévl. = Cotoneaster glaucophylla Franch. 13:302
— *rubro-lutea* Lévl. = Malus Sieboldii (Reg.) Rehd. 13:308
— *serrulata* "Lindl." ex Lévl., non Lindl. = P. Bodinieri Lévl. 13:307
Phyllanthodendron Cavaleriei Lévl. = Phyllanthus Dunnianus (Lévl.) Hand.-Mazz. 14:230
— *Dunnianum* Lévl. = Phyllanthus Dunnianus (Lévl.) Hand.-Mazz. 14:230, 426
— — var. *hypoglaucum* Lévl. = Phyllanthus Dunnianus (Lévl.) Hand.-Mazz. 14:230
— *sp.* Lévl. = Mallotus philippinensis (Lam.) Muell. Arg. 14:233
Phyllanthus *Argyi* Lévl. = Securinega suffruticosa (Pall.) Rehd. 14:230
— Franchetiana Lévl. 14:230
— *Mairei* Lévl. = P. Emblica L. 14:230
Pieris *Bodinieri* Lévl. = P. formosa (Wall.) D. Don, 15:280
— *buxifolia* Lévl. & Vant. = Vaccinium triflorum Rehd. 15:287
— *Cavaleriei* Lévl. [= Leucothoë *spec.* 15:280] = L. Griffithiana Clarke, 18:230
— *coreana* Lévl. = Vaccinium bracteatum Thunb. 15:282
— *divaricata* Lévl. = Vaccinium bracteatum Thunb. 15:282
— *Duclouxii* Lévl. = Vaccinium Duclouxii (Lévl.) Hand.-Mazz., 15:284; 18:231
— *Esquirolii* Lévl. & Vant. = Vaccinium mandarinorum Diels, 15:284
— — var. *discolor* Lévl. & Vant. = Vaccinium mandarinorum Diels, 15:284
— — var. *leucocalyx* Lévl. = Vaccinium pubicalyx var. leucocalyx (Lévl.) Rehd. 15:285
— *Fauriei* Lévl. = Vaccinium bracteatum Thunb. 15:282
— *Fortunati* Lévl. = Gaultheria yunnanensis (Franch.) Rehd. 15:282
— *Gagnepainiana* Lévl. = Vaccinium fragile Franch. 15:286
— *Henryi* Lévl. [= *Xolisma villosa* var. *pubescens* (Franch.) Rehd., 15:281] = Lyonia villosa var. pubescens (Franch.) Rehd. 18:231

Pieris *kouyangensis* Lévl. [= *Xolisma ovalifolia* var. *lanceolata* (Wall.) Rehd. 15:281] = Lyonia ovalifolia var. lanceolata (Wall.) Hand.-Mazz. 18:231

— *longicornu* Lévl. [= Vaccinium *mandarinorum* Diels, 15:284] = V. mandarinorum var. austrosinense (Hand.-Mazz.) Metc. 18:231, 361

— *lucida* Lévl. = Vaccinium malaccense Wight, 15:285

— *Mairei* Lévl. [= *Xolisma ovalifolia* (Wall.) Rehd. 15:281] = Lyonia ovalifolia (Wall.) Drude, 18:230

— — var. *parvifolia* Lévl. [= *Xolisma ovalifolia* var. *lanceolata* (Wall.) Rehd. 15:281] = Lyonia ovalifolia var. lanceolata (Wall.) Hand.-Mazz. 18:231

— *Martini* Lévl. = Vaccinium Dunalianum Wight var. urophyllum Rehd. & Wils. 15:286

— *oligodonta* Lévl. = Maesa japonica (Thbg.) Moritzi ex Zoll. 15:289

— *ovalifolia* var. *denticulata* Lévl. = Vaccinium malaccense Wight, 15:285

— *repens* Lévl. [= *Vaccinium repens* (Lévl.) Rehd. 15:283] = V. fragile Franch. var. myrtifolium Franch. 18:231

— *Ulbrichii* Lévl. [= *Xolisma ovalifolia* (Wall.) Rehd. 15:281] = Lyonia ovalifolia (Wall.) Drude, 18:230

— *vaccinium* Lévl. = Gaultheria yunnanensis (Franch.) Rehd. 15:282

Pinus *Argyi* Lemée & Lévl. [= *P. tabulaeformis* Carr. 10:109] = P. Massoniana Lamb. 17:54

— — var. *longevaginans* [= *P. tabulaeformis* Carr. 10:109] = P. Massoniana Lamb. 17:54

— *Cavaleriei* Lévl. = P. Massoniana Lamb. 10:109; 17:54

— *Komarovi* Lévl. = P. Armandi Franch. 10:108

— *levis* Lemée & Lévl. = P. Armandi Franch. 10:108

— *nana* Faurie & Lemée = P. densiflora Sieb. & Zucc. 10:109

Piptanthus spec. Lévl. = Polygala arillata D. Don, 18:211

Pirus Bodinieri Lévl. = Decaspermum fruticosum Forst. 15:109

— *brunnea* Lévl. (1912) = Photinia villosa (Thbg.) DC. 13:304

— *brunnea* Lévl. (1916), [= *Benzoin glaucum* Sieb. & Zucc. 10:194] = Lindera glauca (Sieb. & Zucc.) Bl. 18:275

— *Cavaleriei* Lévl. = Stranvaesia Davidiana Decne. 13:307

— *Esquirolii* Lévl. = Malus Sieboldii (Reg.) Rehd. 13:308

— *Feddei* Lévl. = Photinia amphidoxa (Schneid.) Rehd. & Wils. 13:306

— *Koehnei* Lévl. = Sorbus Hemsleyi (Schneid.) Rehd. 13:304

— *Mairei* Lévl. = Pyrus Calleryana Decne. 13:310

— *mokpoensis* Lévl. = Photinia villosa var. coreana (Decne.) Rehd. 13:305

Pirus rufifolia Lévl. = Docynia rufifolia (Lévl.) Rehd. 13:310
— *sinensis* Lindl. var. *Maximowicziana* Lévl. = Photinia villosa (Thbg.) DC. 13:304
— *spectabilis* Ait. var. *albescens* Lévl. = Photinia villosa (Thbg.) DC. 13:304
— *subcrataegifolia* Lévl. = Malus Sieboldii (Reg.) Rehd. 13:308
— *Taqueti* Lévl. = Amelanchier asiatica (Sieb. & Zucc.) Endl. ex Walp. 13:308
— *Vanioti* Lévl. = Amelanchier asiatica (Sieb. & Zucc.) Endl. ex Walp. 13:308
Pittosporum *Cavaleriei* Lévl. = P. glabratum Lindl. 12:280
— *trigonocarpum* Lévl. = P. glabratum Lindl. 12:280
Plectranthus *Mairei* Lévl. = P. coetsa Hamilt. 16:314
Podocarpus Mairei Lemée & Lévl. = Keteleeria Davidiana (Bertr.) Beiss. 10:109; 18:254
Pogostemon lavandulaespica Lévl. = Elsholtzia heterophylla Diels, 18:244, 361
Polygala Dunniana Lévl. 18:211
— *Taquetii* Lévl. = P. japonica Houtt. 18:211
Polygonum *Mairei* Lévl. = P. urophyllum Franch. & Bur. 10:184; 17:317
— Statice Lévl. [= *P. multiflorum* Thunb. 10:185] 10:282; 17:317
— *yunnanense* Lévl. = P. cuspidatum Sieb. & Zucc. 17:316
— *zigzag* Lévl. & Vant. = P. emodi Meissn. var. dependens Diels, 10:184; 17:316
Populus *Bonatiana* Lévl. = P. Bonatii Lévl. 10:112
— Bonatii Lévl. 10:112; 18:273
— *macranthela* Lévl. & Vant. 10:111 = P. adenopoda Maxim. 17:65
— *rotundifolia* Griff. var. *macranthela* (Lévl. & Vant.) Lévl. [= P. *macranthela* Lévl. & Vant. 10:111] = P. adenopoda Maxim. 18:273
Porana *Esquirolii* Lévl. = P. sinensis Hemsl. 15:318
— *Gagnepainiana* Lévl. = P. racemosa Roxb. 15:319
Premna *Bodinieri* Lévl. 15:324 = P. puberula Pamp. 18:243
— Cavaleriei Lévl. 15:324
— *Esquirolii* Lévl. = Viburnum congestum Rehd. 16:329
— *Mairei* Lévl. = Meliosma cuneifolia Franch. 18:218
— *Martini* Lévl. = P. puberula Pamp. 15:324
— *Merinoi* Lévl. = Hydrangea strigosa Rehd. 12:277
— *Valbrayi* Lévl. [= *Viburnum foetidum* Wall. 16:331] = Viburnum foetidum var. ceanothoides (C. H. Wright) Hand.-Mazz. 17:250

Prosopis Esquirolii Lévl. = Pterolobium punctatum Hemsl. 13:322
Prunus *daemonifuga* Lévl. & Vant. = P. Persica (L.) Batsch, 13:319
— *diamantina* Lévl. = P. Maackii Rupr. var. diamantina (Lévl.) Koehne, 13:321
— *Dunniana* Lévl. = P. Wilsonii (Diels ex Schneid.) Koehne var. leiobotrys Koehne, 17:340
— *Fauriei* Lévl. = P. Padus L. 13:320
— *Lyi* Blin ex Lévl. = Symplocos paniculata (Thbg.) Miq. 15:297
— *Mairei* Lévl. = Symplocos paniculata (Thbg.) Miq. 15:297
— *myrtacea* Lévl. = P. discadenia Koehne, 13:319
— *Nakaii* Lévl. = P. japonica var. Nakaii (Lévl.) Rehd. 13:319
— odontocalyx Lévl. 13:320
— *Persica* var. *lasiocalyx* Lévl. & Vant. = P. Persica (L.) Batsch, 13:319
— — var. longistyla Lévl. 13:319
— *seoulensis* Lévl. = P. Padus L. var. seoulensis (Lévl.) Nakai, 13:320
— *Taqueti* Lévl. = Rhamnus Taqueti (Lévl.) Schneid. 15:16
— *Vanioti* Lévl. = P. pubigera (Schneid.) Koehne, 13:320
Psychotria *Esquirolii* Lévl. = P. rubra (Lour.) Poir. 16:322
— Henryi Lévl. 16:322; 18:248
— Prainii Lévl. 16:322; 18:248
Pueraria *Argyi* Lévl. & Vant. = P. Thunbergiana (Sieb. & Zucc.) Benth. 13:331; 18:208
— *Bodinieri* Lévl. & Vant. = P. Thunbergiana (Sieb. & Zucc.) Benth. 13:331; 18:208
— *caerula* Lévl. & Vant. = P. Thunbergiana (Sieb. & Zucc.) Benth. 13:331; 18:208, 276
— *Koten* Lévl. = P. Thunbergiana (Sieb. & Zucc.) Benth. 13:331; 18:208
— *Seguini* Lévl. = Dunbaria pulchra Benth. 13:332
Pyrus, see Pirus
Quercus *Argyi* Lévl. = Castanopsis spec. 10:120; 17:71
— *brunnea* Lévl. = Castanopsis hystrix (Hook. f. & Th.) A. DC. 10:118; 17:68
— *Castanopsis* Lévl. [= *Castanopsis caudata* Franch. 10:119] = Castanopsis neo-Cavaleriei A. Camus, 17:69, 371
— *Cavaleriei* Lévl. & Vant. [= *Castanopsis tribuloides* var. *echidnocarpa* King ex Hook. f. 10:119] = Castanopsis neo-Cavaleriei A. Camus, 17:69, 371
— *cepifera* Lévl. p. p. [= *Castanopsis caudata* Franch. 10:119] = Castanopsis Eyrei (Champ.) Tutcher 17:69
— *cepifera* Lévl. p. p. = Lithocarpus spicata Rehd. & Wils. 10:120

Quercus *coreana* Lévl. [= Q. *serrata* Thunb. 10:120; 17:71] = Q. glandulifera Bl. 18:274
— *cryptoneuron* Lévl. = Castanopsis cryptoneuron Rehd. 10:119; 17:71
— *Dunniana,* Lévl. = Sageretia rugosa Hance, 15:12
— *Franchetiana* Lévl. = Castanopsis tibetana Hance, 10:119; 17:70
— *funebris* Lévl. = Q. mongolica Fisch. ex Turcz. in Ledeb. 10:120
— guyavaefolia Lévl. 10:121; 17:71
— *kasaiensis* Lévl. = Q. acuta Thunb. 10:122
— *Kasaimok* Lévl. = Q. acuta Thunb. 10:122
— *Mairei* Lévl. = Lithocarpus spec. 10:120
— *pinfaensis* Lévl. = Castanopsis Fargesii Franch. 10:119
— Prainiana Lévl. 10:121; 17:72
— *pseudoglauca* Lévl. = Q. acuta Thunb. 10:122
— *quelpaertensis* Lévl. = Q. acuta Thunb. 10:122
— *Taquetii* Lévl. = Q. glauca Thunb. 10:121
— *trinervis* Lévl. [= *Castanopsis caudata* Franch. 10:119] = Castanopsis Eyrei (Champ.) Tutcher, 17:69
— *Vaniotii* Lévl. = Q. glauca Thunb. 10:121; 17:72
Rapanea aurea Lévl. = Eurya nitida Korth. 15:99
Reevesia *Cavaleriei* Lévl. = R. pubescens Mast. 15:96
— *Esquirolii* Lévl. = Rhododendron Cavaleriei Lévl. 15:276
— *thyrsoidea* Lévl. = R. pubescens Mast. 15:96
Rhamnus Bodinieri Lévl. 15:15; 18:219
— *Cavaleriei* Lévl. (1910) = R. heterophyllus Oliver 15:14
— *Cavaleriei* Lévl. (1911) = R. Leveilleanus Fedde, 15:17; 18:219
— *coriaceifolius* Lévl. = Sideroxylon Wightianum Hook. & Arn. 15:294
— Esquirolii Lévl. 15:14; 18:219
— hamatidens Lévl. 15:17
— *Martini* Lévl. = Rhamnella Martini (Lévl.) Schneid. 15:11, 377; 18:219
— *myrtillus* Lévl. = Myrsine africana L. 15:293
— *Pasteuri* Lévl. = Gardneria multiflora Mak. 15:309
— *pruniformis* Lévl. = R. leptophyllus Schneid. 15:17
— *pseudo-frangula* Lévl. = R. crenatus Sieb. & Zucc. 15:13
— *Schneideri* Lévl. & Vant. 15:17
— serpyllifolius Lévl. 15:16
— Taqueti (Lévl.) Lévl. 15:16
Raphidophora Dunniana Lévl. 17:57
Rhododendron *albicaule* Lévl. = R. decorum Franch. 15:270
— *Argyi* Lévl. = R. mucronatum (Bl.) G. Don, 15:278

Rhododendron Bachii Lévl. 15:275; 18:229
— *Blinii* Lévl. = R. lutescens Franch. 15:271
— caeruleum Lévl. 15:273; 18:229, 361
— Cavaleriei Lévl. 15:276
— — var. *Chaffanjoni* Lévl. = R. stamineum Franch. 15:275
— *Chaffanjoni* Lévl. = R. stamineum Franch. 15:275
— chrysocalyx Lévl. & Vant. 6:200; 15:276; 18:230
— *cordatum* Lévl. = R. Souliei Franch. 15:270
— *crenatum* Lévl. = R. racemosum Franch. 15:274
— cruentum Lévl. 15:269
— denudatum Lévl. 15:269; 18:229
— Duclouxii Lévl. [= R. *spinuliferum* Franch. 15:274] = × R. Duclouxii Lévl. (R. spiciferum × spinuliferum), fide Hand.-Mazz. 18:229
— *eriandrum* Lévl. = R. caeruleum Lévl. 15:273
— Esquirolii Lévl. 15:276; 18:229
— euonymifolium Lévl. 15:273
— farinosum Lévl. 15:269
— Feddei Lévl. 15:278
— *Franchetianum* Lévl. = R. decorum Franch. 15:270
— *fuchsiaeflora* Lévl. = R. spinuliferum Franch. 15:274
— fuchsiifolium Lévl. 15:276
— *Giraudiasii* Lévl. = R. decorum Franch. 15:270
— *hallaisanense* Lévl. = R. yedoense Maxim. var. poukhanense (Lévl.) Nakai, 15:277
— *Jahandiezii* Lévl. = R. siderophyllum Franch. 15:272
— *kouytchense* Lévl. = R. chrysocalyx Lévl. 18:230
— Leclerei Lévl. 15:271
— *Lemeei* Lévl. = R. lutescens Franch. 15:271
— leucandrum Lévl. 15:272
— liliiflorum Lévl. 15:271
— Lyi Lévl. 15:271
— *Mairei* Lévl. = R. lacteum Franch. 15:269
— *Maximowiczianum* Lévl. 15:278 = R. irroratum Franch. 18:229, 361
— missioniarium Lévl. 15:271
— *motsouense* Lévl. = R. racemosum Franch. 15:274
— *nanum* Lévl. = R. polycladum Franch. 15:273
— *poukhanense* Lévl. = R. yedoense Maxim. var. poukhanense (Lévl.) Nakai, 15:277
— rex Lévl. 15:270; 18:229

Rhododendron *rubro-punctatum* Lévl. & Vant. = R. Bodinieri Franch. 15:272
— *Seguini* Lévl. = R. Bodinieri Franch. 15:272
— *spinigerum* Lévl. = R. chrysocalyx Lévl. & Vant. 15:276
— *tapelouense* Lévl. = R. tatsienense Franch. 15:272
— *Taquetii* Lévl. = R. mucronulatum Turcz. 15:275
— umbelliferum Lévl. 15:277
— *Vaniotii* Lévl. = R. Esquirolii Lévl. 15:276; 18:229
— *xanthoneuron* Lévl. = R. denudatum Lévl. 15:269
Rhus *Argyi* Lévl. = Pistacia chinensis Bge. 14:238
— *Blinii* Lévl. = Cipadessa baccifera Miq. var. sinensis Rehd. & Wils. 14:227, 426
— *Bodinieri* Lévl. = Spondias axillaris Roxb. 14:237
— *Bofillii* Lévl. = Meliosma Oldhami Miq. 15:10
— *Cavaleriei* Lévl. = Eurycorymbus Cavaleriei (Lévl.) Rehd. & Hand.-Mazz. 15:8; 18:217
— *echinocarpa* Lévl. p. p. = R. punjabensis Stewart var. sinica (Diels) Rehd. & Wils. 14:238
— *echinocarpa* Lévl. p. p. = R. trichocarpa Miq. 14:239
— *Esquirolii* Lévl. = R. punjabensis Stewart var. sinica (Diels) Rehd. & Wils. 14:238
— *gummifera* Lévl. = Pistacia chinensis Bge. 14:238
— *Mairei* Lévl. = R. punjabensis Stewart var. sinica (Diels) Rehd. & Wils. 14:238
Rhynchosia Argyi Lévl. = Glycine Soja Sieb. & Zucc. 18:208
Ribes *pachysandroidea* Lévl. = R. laurifolium Jançz. 12:279
Rosa adenoclada Lévl. 13:314; 17:339
— *Argyi* Lévl. = R. lucidissima Lévl. 18:257
— Banksiae f. *aculeata* Lévl. = R. Banksiae Ait. 13:315
— — f. *albiflora* Lévl. = R. Banksiae Ait. 13:315
— — f. *luteiflora* Lévl. = R. Banksiae f. lutea Lindl. 13:315
— — f. *subinermis* Lévl. = R. Banksiae Ait. 13:315
— *Blinii* Lévl. = R. multiflora var. carnea Thory, 13:311
— *Bodinieri* Lévl. & Vant. [= R. *microcarpa* Lindl. 13:314] = R. cymosa Tratt. 17:339; 18:257
— *Cavaleriei* Lévl. [= R. *microcarpa* Lindl. 13:314] = R. cymosa Tratt. 17:339; 18:257
— *Chaffanjoni* Lévl. & Vant. [= R. *microcarpa* Lindl. 13:314] = R. cymosa Tratt. 17:339; 18:257
— *Charbonneaui* Lévl. = R. longicuspis A. Bertol. 13:314
— *clavigera* Lévl. = R. Brunonii Lindl. 13:312
— *Duclouxii* Lévl. = R. odorata var. gigantea (Coll.) Rehd. & Wils. 13:317

Rosa *Esquirolii* Lévl. & Vant. [= R. *microcarpa* Lindl. 13:314] = R. cymosa Tratt. 17:339; 18:257
— *Fauriei* Lévl. p. p. = R. Maximowicziana Reg. 13:312
— *Fauriei* Lévl. p. p. = R. acicularis Lindl. 13:317
— *gechouitangensis* Lévl. = R. odorata Sweet, 13:316
— Gentiliana Lévl. & Vant. 13:313; 17:338
— — var. *adenoclada* (Lévl.) Lévl. = R. adenoclada Lévl. 13:314
— *iochanensis* Lévl. = R. sertata Rolfe, 13:318
— *Korsakoviensis* Lévl. = R. acicularis Lindl. 13:317; 18:257
— *Lebrunii* Lévl. = R. multiflora var. carnea Thory, 13:311
— lucidissima Lévl. 13:316; 18:257
— *macrophylla* var. *hypoleuca* Lévl. = R. multiflora var. cathayensis Rehd. & Wils. 13:311
— Mairei Lévl. 13:319; 17:339
— Marrettii Lévl. 13:318; 18:257
— *mokanensis* Lévl. p. p. [= R. *multiflora* var. *quelpaertensis* (Lévl.) Rehd. & Wils. 13:310] = R. multiflora var. mokanensis (Lévl.) Rehd. 17:336
— *mokanensis* Lévl. p. p. = R. Wichuraiana Crép. 13:311
— *Nakaiana* Lévl. = R. multiflora Thunb. var. adenophora Franch. & Sav. 13:310; 17:336
— *oulengensis* (sic) Lévl. = R. odorata Sweet, 13:316
— *Parmentieri* Lévl. = R. Davidi Crép. var. elongata Rehd. & Wils. 13:318; 17:339
— *Patrum* Lévl. = R. cymosa Tratt. 17:339, in discuss.
— *quelpaertensis* Lévl. = R. multiflora var. quelpaertensis (Lévl.) Rehd. & Wils. 13:310; 17:337
— Rubus Lévl. & Vant. 13:312; 17:338
— — var. *yunnanensis* Lévl. = R. Rubus Lévl. & Vant. 13:312
— *sericea* f. *aculeata* Focke ex Lévl. = R. omeiensis Rolfe, 13:318
— — f. *eglandulosa* Lévl. = R. omeiensis Rolfe, 13:318
— — f. *inermis* Lévl. = R. omeiensis Rolfe, 13:318
— *Sorbus* Lévl. = R. omeiensis Rolfe, 13:318; 17:339
— *Taqueti* Lévl. p. p. = R. acicularis Lindl. 13:317
— *Taqueti* Lévl. p. p. = R. Wichuraiana Crép. 13:311; 17:338, in discuss.
— *tongtchouanensis* Lévl. = R. odorata Sweet, 13:316
— *Willmottiana* Lévl. = R. longicuspis A. Bertol. 13:314; 17:339
Rubus alnifoliolatus Lévl. 18:41
— *ampelophyllus* Lévl. = R. crataegifolius Bge. f. makinoensis (Lévl. & Vant.) Koidz. 18:39

Rubus *ampliflorus* Lévl. & Vant. = R. tephrodes Hance var. ampliflorus (Lévl. & Vant.) Hand.-Mazz. 18:30
— *andropogon* Lévl. = R. multibracteatus Lévl. & Vant. 18:33
— *arbor* Lévl. & Vant. = R. malifolius Focke 18:28
— *Argyi* Lévl. = R. Thunbergii Sieb. & Zucc. 18:44
— Blinii Lévl. 18:37
— *Bodinieri* Lévl. & Vant. = R. Buergeri Miq. 18:37
— *Bonati* Lévl. = R. foliolosus D. Don, 18:48
— *Boudieri* Lévl. = R. foliolosus D. Don, 18:48
— calycacanthus Lévl. 18:31
— — var. *Buergerifolia* Lévl. = R. calycacanthus Lévl. 18:31
— *Cavaleriei* Lévl. & Vant. = R. setchuenensis Bur. & Franch. 18:34
— *Chaffanjoni* Lévl. & Vant. = R. amphidasys Focke, 18:35
— *coreanus* Miq. var. *Nakaianus* Lévl. = R. coreanus Miq. 18:46
— *crataegifolius* Bge. var. *subcrataegifolius* Lévl. & Vant. = R. incisus var. subcrataegifolius (Lévl. & Vant.) Rehd. 18:40
— croceacanthus Lévl. 18:42
— *Darrisii* Lévl. = R. calycacanthus Lévl. 18:31
— *diamantinus* Lévl. = R. idaeus var. diamantinus (Lévl.) Rehd. 18:52
— *Duclouxii* Lévl. = R. Delavayi Franch. 18:41
— *erectifolius* Lévl. = R. crataegifolius Bge. f. makinoensis (Lévl. & Vant.) Koidz. 18:39
— Esquirolii Lévl. 18:34
— Fauriei Lévl. & Vant. 18:38
— Feddei Lévl. & Vant. 18:35
— *Franchetiana* Lévl. = R. fragarioides Bertol. var. adenophora Franch. 18:26
— Gentilianus Lévl. & Vant. 18:29
— *Grossularia* Lévl. & Vant. = R. incisus Thbg. 18:40
— hastifolius Lévl. & Vant. 18:36
— *Hoatiensis* Lévl. = R. coreanus Miq. 18:46
— holadenus Lévl. 18:31
— ikenoensis Lévl. & Vant. 18:27
— illudens Lévl. 18:48
— *itoensis* Lévl. & Vant. = R. crataegifolius f. itoensis (Lévl. & Vant.) Koidz. 18:39
— *Jamini* Lévl. & Vant. = R. irenaeus Focke, 18:36
— kanayamensis Lévl. & Vant. 18:51
— *kerriifolius* Lévl. & Vant. = R. corchorifolius L. f. 18:37
— *Kinashii* Lévl. & Vant. = R. mesogaeus Focke, 18:50
— — var. *coreensis* Lévl. & Vant. = R. adenochlamys (Focke) Focke, 18:49

Rubus *Kuntzeanus* var. *xanthacantha* (Lévl.) Lévl. = R. innominatus var. Kuntzeanus (Hemsl.) Bailey, 18:49
— *Labbei* Lévl. & Vant. = R. calycacanthus Lévl. 18:31
— *longistylus* Lévl. = R. foliolosus D. Don, 18:48
— Lyi Lévl. 18:35
— Mairei Lévl. (1912) 18:28
— *Mairei* Lévl. (1913) = R. foliolosus D. Don, 18:48
— *Makinoensis* Lévl. & Vant. = R. crataegifolius Bge. f. makinoensis (Lévl. & Vant.) Koidz. 18:39
— marmoratus Lévl. & Vant. 18:42
— *Matsumuranus* Lévl. & Vant. = R. idaeus var. Matsumuranus (Lévl. & Vant.) Koidz. 18:52
— *minimiflorus* Lévl. = R. Lambertianus Ser. var. minimiflorus (Lévl.) Cardot, 18:30
— minusculus Lévl. & Vant. 18:41
— *Mongouilloni* Lévl. & Vant. = R. alceaefolius Poir. 18:32
— *Mouyousensis* Lévl. = R. chroosepalus Focke, 18:28
— multibracteatus Lévl. & Vant. 18:33
— — var. *Demangei* Lévl. = R. alceaefolius Poir. 18:32
— *myriadenus* Lévl. = R. sumatranus Miq. 18:43
— — var. *grandifoliolatus* Lévl. = R. sumatranus Miq. 18:43
— *Nakaianus* Lévl. = R. coreanus Miq. 18:46
— *ouensanensis* Lévl. & Vant. = R. crataegifolius f. itoensis (Lévl. & Vant.) Koidz. 18:39
— *Papyrus* Lévl. = R. ichangensis Hemsl. & Ktze. 18:29
— paykouangensis Lévl. 18:30
— *petaloides* Lévl. = R. chroosepalus Focke, 18:28
— pinfaensis Lévl. & Vant. 18:50
— *pseudosaxatilis* Lévl. = R. coreanus Miq. 18:46
— — var. *Kouytchensis* Lévl. = R. coreanus Miq. 18:46
— *Pyi* Lévl. = R. micranthus D. Don, 18:45
— *quelpaertensis* Lévl. = R. coreanus Miq. 18:46
— refractus Lévl. 18:27
— Rocheri Lévl. 18:27
— *sachalinensis* Lévl. = R. idaeus var. aculeatissimus Reg. & Tiling, 18:53
— schizostylus Lévl. 18:48
— sino-Sudrei Lévl. 18:36
— stephanandria Lévl. 18:44
— *subcrataegifolius* (Lévl. & Vant.) Lévl. = R. incisus Thunb. var. subcrataegifolius (Lévl. & Vant.) Rehd. 18:40

Rubus *suberectifolius* Lévl. = R. crataegifolius Bge. f. makinoensis (Lévl. & Vant.) Koidz. 18:39
— *talaikiaensis* Lévl. = R. Thunbergii Sieb. & Zucc. 18:44
— *Taquetii* Lévl. = R. parvifolius L. 18:47
— *Thunbergii* Sieb. & Zucc. var. *Argyi* (Lévl.) Lévl. = R. Thunbergii Sieb. & Zucc. 18:44
— *Thunbergii* var. *talaikiaensis* (Lévl.) Lévl. = R. Thunbergii Sieb. & Zucc. 18:44
— tongchouanensis Lévl. 18:45
— *triflorus* Rich. var. *diversifolius* Lévl. = R. pseudojaponicus Koidz. 18:26
— *umbellifer* Lévl. = Grewia biloba var. parviflora (Bge.) Hand.-Mazz. 15:93
— *Vanioti* Lévl. = R. corchorifolius L. f. 18:37
— *xanthacantha* Lévl. = R. innominatus S. Moore var. Kuntzeanus (Hemsl.) Bailey, 18:49
— *Yabei* Lévl. & Vant. = R. idaeus var. Yabei (Lévl. & Vant.) Koidz. 18:51
Sabia *Cavaleriei* Lévl. = Orixa japonica Thunb. 14:224
— Dielsii Lévl. 15:9
— *Dunnii* Lévl. = S. gracilis Hemsl. 15:9
— *edulis* Lévl. p. p. = Iodes ovalis Bl. 15:2
— *edulis* Lévl. p. p. = Iodes Seguini (Lévl.) Rehd. 15:3
— *Esquirolii* Lévl. = Gardneria multiflora Makino, 15:309
— *Feddei* Lévl. = Orixa japonica Thunb. 14:224
— parviflora var. nitidissima Lévl. 15:10
Sageretia Bodinieri Lévl. = Rhamnus Esquirolii Lévl. 15:14
Salix andropogon Lévl. & Vant. 10:117; 18:255, 361
— angiolepis Lévl. & Vant. 10:113; 18:255
— *anisandra* Lévl. & Vant. 10:113 = S. dodecandra Lévl. 18:254
— *Argyi* Lévl. = S. Wilsonii Seemen, 10:112; 18:254
— Blinii Lévl. 10:117; 18:274
— *Camusii* Lévl. 10:115 = S. dodecandra Lévl. 18:254
— Cavaleriei Lévl. 10:113; 17:65; 18:254
— dodecandra Lévl. 10:112; 18:254
— *dolichostyla* var. *hirosakensis* Lévl. & Vant. = S. hondoensis Koidz. 10:114
— *Duclouxii* Lévl. (1909), 10:117; 17:66 = S. variegata Franch. 18:255
— — var. *kouytchensis* Lévl. [= S. *kouytchensis* (Lévl.) Schneid. 10:117 = S. *Duclouxii* Lévl. 17:66] = S. variegata Franch. 18:255

Salix *Duclouxii* Lévl. (1915) [= *S. Kouytchensis* (Lévl.) Schneid.] = S. variegata Franch. 18:255
— erioclada Lévl. 10:115; 17:65; 18:255
— *Feddei* Lévl. = S. koreensis Anderss. 10:114; 18:273
— *funebris* Lévl. = S. Wallichiana Anderss. 10:116; 18:255
— *gymnolepis* Lévl. [= S. *Makinoana* Seemen, 10:114] = S. Gilgiana Seemen, 18:274
— hallaisanensis Lévl. [= S. *caprea* L. 10:116] 18:273
— — var. *nervosa* Lévl. [= S. *caprea* L. 10:116] 18:273
— hamatidens Lévl. 10:114
— *ignicoma* Lévl. & Vant. = S. vulpina Anderss. 10:115
— *japonica* var. *nippoensis* Lévl. = S. japonica Thunb. 10:116
— *Kinashii* Lévl. = S. amygdalina L. var. nipponica (Franch. & Sav.) Schneid. 10:113; 18:273
— *korsakoviensis* Lévl. = S. sachalinensis Fr. Schmidt, 10:117
— luctuosa Lévl. 10:115; 17:66; 18:255
— *Mairei* Lévl. = S. Wallichiana Anderss. 10:116; 18:255
— *pachyclada* Lévl. 10:116 = S. Wallichiana Anderss. 18:255
— *pogonandra* Lévl. = S. koreensis Anderss. 10:114; 18:273
— *polyandra* Lévl. = S. Cavaleriei Lévl. 10:113; 18:254
— *pseudo-Gilgiana* Lévl. = S. koreensis Anderss. 10:114; 18:273
— *pseudo-jessoensis* Lévl. = S. koreensis Anderss. 10:114; 18:273
— *pseudo-lasiogyne* Lévl. = S. koreensis Anderss. 10:114; 18:273
— *Pyi* Lévl. = S. Cavaleriei Lévl. 10:113; 18:254
— sapporoensis Lévl. 10:117
— *Shirai* var. *vulcaniana* Lévl. & Vant. = S. vulpina Anderss. 10:115
— *Taquetii* Lévl. = S. Blinii Lévl. 10:117; 18:273
— *yunnanensis* Lévl. = S. Cavaleriei Lévl. 10:113; 18:254
Sambucus *Argyi* Lévl. = S. javanica Bl. var. Argyi (Lévl.) Rehd. 16:328
Sarcopyramis *Bodinieri* Lévl. & Vant. = S. napalensis Wall. 18:227
— *nepalensis* var. *Bodinieri* (Lévl. & Vant.) Lévl. = S. napalensis Wall. 18:227
Saurauja Vanioti Lévl. = Celastrus Vanioti (Lévl.) Rehd. 14:249
Schizandra *hypoglauca* Lévl. = S. Henryi Clarke, 10:191
Senecio *Gentilianus* Vaniot = S. saxatilis Wall. ex DC. 18:253
Sideroxylon Bodinieri Lévl. = Handeliodendron Bodinieri (Lévl.) Rehd. 16:66, fig., pl. 119; 18:217
Sloanea *Hanceana* Lévl. non Hemsl. = Sloanea sinensis (Hance) Hu, 15:91
Smilax *Blinii* Lévl. = S. glabra Roxb. 10:110; 17:58
— *Bodinieri* Lévl. & Vant. = S. glauco-china Warb. 17:61

Smilax *castaneiflora* Lévl. 10:111; 17:62
— *Cavaleriei* Lévl. & Vant. apud Lévl. = S. scobinicaulis Wright, 17:60
— *China* "L." ex Lévl., non L. = S. glauco-china Warb. 17:61
— — f. *obtusa* Lévl. = S. China L. 17:61
— *Darrisii* Lévl. 10:111 = S. microphylla Wright, 17:59
— *Dunniana* Lévl. = S. glabra Roxb. 17:58
— *Esquirolii* Lévl. = S. leucocarpa Lévl. & Vant. apud Lévl. 17:60
— *glabra* Roxb. var. *maculata* Bodinier ex Lévl. = S. glabra Roxb. 17:58
— *gracillima* Lévl. & Vant. = S. microphylla Wright, 17:59
— *herbacea* L. var. *foetida* Lévl. = S. herbacea L. var. acuminata Wright, 17:58
— — var. *heterophylla* Lévl. = S. herbacea L. var. acuminata Wright, 17:58
— *Labordei* Lévl. & Vant. = S. microphylla Wright, 17:59
— *Lebrunii* Lévl. = S. micropoda A. DC. var. reflexa Norton, 17:62
— leucocarpa Lévl. & Vant. 17:60
— *loupouensis* Lévl. [= S. *ferox* Wall. 10:110] = S. megalantha Wright, 17:60
— *luteocaulis* Lévl. 10:111 = S. menispermoidea A. DC. 17:62
— Lyi Lévl., 17:63
— *Mairei* Lévl. 10:111 = S. microphylla Wright, 17:59
— *Martini* Lévl. & Vant. = S. scobinicaulis Wright, 17:60
— *ocreata* Lévl. & Vant. apud Lévl. = S. scobinicaulis Wright, 17:60
— *perulata* Lévl. & Vant. = S. perfoliata Lour. 17:64
— *Pinfaensis* Lévl. & Vant. apud Lévl. = S. cocculoides Warb. var. lanceolata Norton, 17:63
— stemonifolia Lévl. & Vant. apud Lévl. 17:62
— *Taquetii* Lévl. = S. China L. 17:61
— tortopetiolata Lévl. & Vant. ex Lévl. 17:63
Solanum *Bodinieri* Lévl. = S. aculeatissimum Jacq. 16:314
— *Cavaleriei* Lévl. = S. aculeatissimum Jacq. 16:314
— *Dunnianum* Lévl. = S. Capsicastrum Link ex Schauer 18:245
— *Heudesii* Lévl. = S. cornutum Lam. 18:245, 361
Sonerila Cavaleriei Lévl. = Oxyspora paniculata DC. 15:110
— *Esquirolii* Lévl. = Plagiopetalum Esquirolii (Lévl.) Rehd. 15:110
Sophora *Cavaleriei* Lévl. = S. glauca var. albescens Rehd. 13:323
— *Mairei* Lévl. = S. japonica L. 13:322
Sorbus *Aria* var. *Mairei* Lévl. = S. Keissleri (Schneid.) Rehd. 13:304
— *Mairei* Rehd. & Lévl. ex Lévl. = S. Keissleri (Schneid.) Rehd. 13:304
— *Valbrayi* Lévl. = S. Koehneana Schneid. 13:303
Speranskia *tonkinensis* Lévl. = S. cantonensis (Hance) Pax & Hoffm. 14:232

Spiraea *atemnophylla* Lévl. = S. Veitchii Hemsl. 13:301
— *Bodinieri* Lévl. = S. japonica L. f. var. acuminata Franch. 13:301
— — var. *concolor* Lévl. = S. japonica L. f. var. acuminata Franch. 13:301
— Cavaleriei Lévl. 13:300
— *Esquirolii* Lévl. = S. japonica L. f. var. acuminata Franch. 13:301
— *Fauriei* Lévl. = S. media Schmidt var. monbetsusensis (Franch.) Cardot, 13:299
— *holorhodontha* Lévl. = Rodgersia pinnata Franch. 13:301, in nota.
— Mairei Lévl. 13:301
— Martini Lévl. 13:300; 17:334
— *microphylla* Lévl. = S. ovalis Rehd. 13:300
— *ouensanensis* Lévl. = S. pubescens Turcz. 13:300
Stachyrus *Esquirolii* Lévl. = S. yunnanensis Franch. 15:103
Stellera *Bodinieri* Lévl. = S. Chamaejasme L. 15:106
Stemona *Argyi* (Lévl. & Vant.) Lévl. = S. japonica (Bl.) Miq. 17:57
Stephanotis yunnanensis Lévl. 15:317 = Marsdenia stenantha Hand.-Mazz. 18:241
Sterculia Bodinieri Lévl. [= Phyllanthus *spec.* 14:231] = Phyllanthus Bodinieri (Lévl.) Rehd. 18:212
— *malvacea* Lévl. = Eriolaena malvacea (Lévl.) Hand.-Mazz. 15:95
— *tiliacea* Lévl. = Grewia abutilifolia Vent. ex Juss. 15:93
Stranvaesia Argyi Lévl. = Photinia serrulata Lindl. 13:306
Strobilanthes *deutziaefolia* (Lévl.) Lévl. = Abelia Schumannii (Graebn.) Rehd. 16:334
— *hypericifolia* (Lévl.) Lévl. = Abelia myrtilloides Rehd. 16:334
— lofouensis Lévl., 18:247
— *yangtsekiangensis* Lévl. = Cystacanthus yangtsekiangensis (Lévl.) Rehd. 16:315
Strobilanthopsis deutziaefolius Lévl. = Abelia Schumannii (Graebn.) Rehd. 16:334
— *hypericifolius* Lévl. = Abelia myrtilloides Rehd. 16:334
Strychnos Esquirolii Lévl. = Zizyphus pubinervis Rehd. 18:218
Styrax Argyi Lévl. 15:295; 18:233
— *Bodinieri* Lévl. = S. japonicus Sieb. & Zucc. 15:295; 18:233
— *Cavaleriei* Lévl. (1907) = S. grandiflorus Griff. 15:296; 18:233
— *Cavaleriei* Lévl. (1911) = Pterostyrax Leveillei (Fedde) Chun, 15:295; 18:233
— *Esquirolii* Lévl. = Deutzia Esquirolii (Lévl.) Rehd. 12:276; 14:202
— *Leveillei* Fedde ex Lévl. = Pterostyrax Leveillei (Fedde) Chun, 15:295

Styrax *touchanensis* Lévl. = S. grandiflorus Griff. 15:296; 18:233
Symplocos *Argyi* Lévl. = S. setchuensis Brand, 15:296
— *aurea* Lévl. = S. lancifolia Sieb. & Zucc. 15:299
— *Balfourii* Lévl. = S. Bodinieri Brand, 15:299
— *Bodinieri* Lévl., non Brand = S. punctata Brand, 15:300
— *caerulea* Lévl. = S. botryantha Franch. 15:300
— Cavaleriei Lévl. 15:300
— *coronigera* Lévl. 15:296 = S. Ernesti Dunn, 18:233
— *Courtoisii* Lévl. = Ilex purpurea Hassk. 18:215
— *Dielsii* Lévl. = S. anomala Brand, 15:300
— *Dunniana* Lévl. = S. stellaris Brand, 15:301
— *Esquirolii* Lévl. = S. anomala Brand, 15:300
— Mairei Lévl. 15:301
— Martini Lévl. 15:300
— pinfaensis Lévl. 15:298
— *Prainii* Lévl. = S. adenopus Hance, 15:301
— *Seguini* Lévl. = Eriobotrya Seguini (Lévl.) Cardot, 13:308
— *spicata* "Roxb." ex Lévl., non Roxb. = S. pinfaensis Lévl. 15:298
— *splendens* Lévl. = S. punctata Brand, 15:300
— *Stapfiana* Lévl. = S. fasciculata Zoll. var. chinensis Brand, 15:298
— *vinoso-dentata* Lévl. = S. laurina (Retz.) Wall. 15:298
— *xanthoxantha* Lévl. [= S. *coronigera* Lévl. 15:296] = S. Ernesti Dunn, 18:233
Syringa Fauriei Lévl., 15:303
Tecoma Cavaleriei Lévl. = Staphylea holocarpa Hemsl. 15:1
— *Mairei* Lévl. = Incarvillea Delavayi Bur. & Fr. 16:315
Terminalia Kouytchensis Lévl. = Gouania javanica Miq. 15:18
— *Mairei* Lévl. = Combretum Wallichii DC. 15:108
Teucrium Esquirolii Lévl. = Plectranthus ternifolius D. Don, 16:313
Thea Camellia var. *lucidissima* Lévl. [= *Thea Pitardii* var. *lucidissima* (Lévl.) Rehd. 15:99] = Camellia Pitardii C. Stuart var. lucidissima (Lévl.) Rehd. 18:223
— *Cavaleriana* Lévl. [= *Thea Grijsii* (Hance) Kochs, 15:98] = Camellia Grijsii Hance, 18:223
— *chinensis* var. *androxantha* Lévl. [= *Thea Costei* (Lévl.) Rehd. 15:98] = Camellia Costei Lévl. 18:223
— *Mairei* Lévl. [= *Thea Pitardii* (C. Stuart) Rehd. p. p. 15:98] = Camellia Mairei (Lévl.) Melchior, 18:223
— *podogyna* Lévl. [= *Thea oleosa* Lour. 15:98] = Camellia oleosa (Lour.) Rehd. 18:223
Thuja *orientalis* L. var. *Argyi* Lévl. & Lemée = T. orientalis L. 17:55

Thymus Cavaleriei Lévl. = Micromeria biflora Benth., 16:312
Tilia *Kinashii* Lévl. & Vant. = T. Miqueliana Maxim. 15:92
— *tuan* var. *Cavaleriei* V. Engl. & Lévl. = T. tuan Szysz. 15:92
Trachelospermum *Cavaleriei* Lévl. 15:316 = Cryptolepis Buchanani Roem. & Schult. 18:239
— Dunnii Lévl. 15:311
— *Esquirolii* Lévl. [= *Melodinus khasianus* Hook. f. 15:313] = Melodinus Hemsleyanus Diels, 18:234, 361
— *Navillei* Lévl. = Aganosma cymosa (Roxb.) G. Don, 15:315; 18:237
— *rubrinerve* Lévl. p. p. = Trachelospermum Dunnii (Lévl.) Lévl. 18:237, 361
— *rubrinerve* Lévl. p. p. = Trachelospermum gracilipes Hook. f. 15:311; 18:236
Trema *Dunniana* Lévl. = T. orientalis Bl. 10:123
Trifolium ? *polygonum* Lévl. = Lespedeza striata (Thunb.) Hook. & Arn. 13:329
Tsuga Mairei Lemée & Lévl. = Taxus chinensis (Pilger) Rehd. 17:54
Tylophora *Argyi* Schlechter ex Lévl. p. p. = Cynanchum Mooreanum Hemsl. 18:239
— *Argyi* Schlechter ex Lévl. p. p. = T. floribunda Miq. 18:240
— *Cavaleriei* Lévl. = Cynanchum caudatum (Miq.) Maxim. 18:239
— *Hyopsis* Lévl. = T. Dielsii (Lévl.) Hu, 18:241
— Leveilleana Schlechter ex Lévl. 18:240
Ulmus Cavaleriei Lévl. = Pteroceltis Tatarinowii Maxim. 10:123
Uvaria Cavaleriei Lévl. = Fissistigma Cavaleriei Rehd. 10:192
Vaccinium albidens Lévl. & Vant. 15:283
— *buxifolium* Lévl. = V. triflorum Rehd. 15:287
— *Cavaleriei* Lévl. & Vant. = Schoepfia jasminodora Sieb. & Zucc. 10:131
— *Fauriei* Lévl. = V. japonicum Miq. 15:288
— foetidissimum Lévl. & Vant. 15:286
— *Mairei* Lévl. [= *Xolisma ovalifolia* (Wall.) Rehd. 15:281] = Lyonia ovalifolia (Wall.) Drude, 18:230
— *oligodontum* (Lévl.) Lévl. = Maesa japonica (Thbg.) Moritzi ex Zoll. 15:289
— *siccum* Lévl. & Vant. = V. japonicum var. sinicum (Nakai) Rehd. 15:288
— *Taquetii* Lévl. = V. bracteatum Thunb. 15:282
— *yunnanense* Franch. var. *Franchetiana* Lévl. = Gaultheria yunnanensis (Franch.) Rehd. 15:282
Vernonia arbor Lévl. [= ? *V. papillosa* Franch. 18:251] 18:277

Vernonia *Esquirolii* Vaniot [= *Senecio Walkeri* Arnott, 18:253, 361] = Senecio Hoi Dunn, 18:277
— *Esquirolii* Lévl., non Vaniot = Vernonia volkameriaefolia DC. 18:251, 276
— *Leveillei* Fedde ex Lévl. = V. volkameriaefolia DC. 18:251
— *Martini* Vaniot = V. saligna DC. 18:251, 277
— *Seguini* Vaniot = V. saligna DC. 18:251, 277
— *spelaeicola* Vaniot [= *Senecio Walkeri* Arnott, 18:253] = Senecio spelaeicola (Vant.) Gagnep. 18:277
— *subarborea* Vaniot = V. extensa DC. 18:252, 277
— *Vanioti* Lévl. = V. arborea Ham. 18:250, 276
Viburnum *ajugifolium* Lévl. [= V. *foetidum* Wall. 16:331] = V. foetidum var. ceanothoides (C. H. Wright) Hand.-Mazz. 18:250
— *barbigerum* Lévl. = V. corylifolium Hook. f. & Th. 16:332
— *Bodinieri* Lévl. = V. setigerum Hance, 16:332
— *botryoideum* Lévl. = V. erubescens Wall. 16:328
— Cavaleriei Lévl. 16:329; 18:250
— *Chaffanjoni* Lévl. = V. ternatum Rehd. 16:330
— *Dielsii* Lévl. = Callicarpa Dielsii (Lévl.) P'ei, 15:323
— *Dunnianum* Lévl. = V. corylifolium Hook. f. & Th. 16:332
— *Komarovii* Lévl. & Vant. = Photinia parvifolia (Pritz.) Schneid. 13:305
— *Mairei* Lévl. = V. congestum Rehd. 16:329
— *Martini* Lévl. = V. sympodiale Graebn. 16:329
— *pinfaense* Lévl. p. p. = V. cylindricum Ham. var. crassifolium (Rehd.) Schneid. 16:330
— *pinfaense* Lévl. p. p. = V. sempervirens K. Koch, 16:331
— *Stapfianum* Lévl. = V. oliganthum Batal. 16:328
— *Taquetii* Lévl. = V. erosum Thbg. var. Taquetii (Lévl.) Rehd. 16:333
— *Touchanense* Lévl. = V. foetidum Wall. var. rectangulatum (Graebn.) Rehd. 16:331
— *Valbrayi* Lévl. = V. foetidum var. ceanothoides (C. H. Wright) Hand.-Mazz. 18:250
Vitex Esquirolii Lévl. = Buddleia asiatica Lour. 15:309
Vitis *Bodinieri* Lévl. & Vant. = Ampelopsis Bodinieri (Lévl. & Vant.) Rehd. 15:23
— *Cavaleriei* Lévl. & Vant. = V. flexuosa Thbg. var. parvifolia (Roxb.) Gagnep. 15:18
— *Chaffanjoni* Lévl. = Ampelopsis Chaffanjoni (Lévl.) Rehd. 15:25; 18:220

Vitis *chrysobotrys* Lévl. & Vant. = Iodes ovalis Bl. 15:2
— *Delavayana* "Franch." ex Lévl., non Franch. = Parthenocissus himalayana (Royle) Planch. var. rubrifolia (Lévl. & Vant.) Gagnep. 15:22
— *dichromocarpa* Lévl. = Cayratia dichromocarpa (Lévl.) Rehd. 15:27
— *Dunniana* Lévl. = Ampelopsis aconitifolia Bge. var. palmiloba (Carr.) Rehd. 15:25
— *Esquirolii* Lévl. & Vant. = Tetrastigma Hemsleyanum Diels & Gilg, 15:19
— *Feddei* Lévl. = Parthenocissus heterophylla (Bl.) Merr. 15:22
— *flexuosa* "Thunb." ex Lévl. p. p., non Thbg. = V. flexuosa Thbg. var. parvifolia (Roxb.) Gagnep. 15:18
— *flexuosa* "Thunb." ex Lévl. p. p., non Thbg. = V. Wilsonae Veitch, 15:18
— — var. *Mairei* Lévl. = V. Thunbergii Sieb. & Zucc. var. adstricta (Hance) Gagnep. 15:19
— — var. *Mairei* (Lévl.) Lévl. (err.) = Tetrastigma serrulatum (Roxb.) Planch. 15:20
— *Gentiliana* Lévl. & Vant. = Ampelopsis Delavayana var. Gentiliana (Lévl. & Vant.) Hand.-Mazz. 15:24, 377; 18:219
— *heterophylla* "Thunb." ex Lévl. p. p., non Thbg. = Ampelopsis Bodinieri (Lévl. & Vant.) Rehd., 15:23
— *heterophylla* "Thunb." ex Lévl. p. p., non Thunb. = Ampelopsis Bodinieri var. cinerea (Gagnep.) Rehd. 15:23
— *heterophylla* Thunb. var. *aconitifolia* Lévl. & Vant. = Ampelopsis aconitifolia Bge. 18:220
— *Labordei* Lévl. = Tetrastigma Hemsleyanum Diels & Gilg, 15:19
— *Lyjoannis* Lévl. = Ampelopsis Bodinieri var. cinerea (Gagnep.) Rehd. 15:23
— *Mairei* Lévl. (1909) p. p. = Tetrastigma serrulatum (Roxb.) Planch. 15:20
— *Mairei* Lévl. (1909) p. p. = Cayratia oligocarpa var. glabra Gagnep. 15:26
— *Mairei* Lévl. (1912) = Gynostemma pentaphyllum (Thbg.) Makino, 15:27
— *Marchandii* Lévl. = V. Wilsonae Veitch, 15:18
— *Martini* Lévl. & Vant. = Gynostemma pentaphyllum, (Thbg.) Makino, 15:27
— *megaphylla* Lévl. = Ampelopsis Chaffanjoni (Lévl.) Rehd. 15:25
— *multijugata* Lévl. & Vant. = Ampelopsis cantoniensis (Hook. & Arn.) Planch. 15:26

Vitis *obtecta* Wall. var. *glabra* (Lévl.) Lévl. = Tetrastigma obtectum (Wall.) Planch. var. β glabrum Gagnep. 15:21
— — var. *Potentilla* (Lévl. & Vant.) Lévl. = Tetrastigma obtectum var. Potentilla (Lévl. & Vant.) Gagnep. 15:21
— — var. *Potentilla* f. *glabra* (Lévl.) Lévl. = Tetrastigma obtectum (Wall.) Planch. var. β glabrum Gagnep. 15:21
— — var. *Potentilla* f. *pilosa* (Pl.) Lévl. = Tetrastigma obtectum var. Potentilla (Lévl. & Vant.) Gagnep. 15:21
— *oligocarpa* Lévl. & Vant. = Cayratia oligocarpa (Lévl. & Vant.) Gagnep. 15:26; 18:220
— *Potentilla* Lévl. & Vant. = Tetrastigma obtectum var. Potentilla (Lévl. & Vant.) Gagnep. 15:21
— — var. *glabra* Lévl. = Tetrastigma obtectum (Wall.) Planch. var. β glabrum Gagnep. 15:21; 18:219
— *prunisapida* Lévl. & Vant. = V. Davidi (Rom. du Caill.) Foëx, 15:19
— *quelpaertensis* Lévl. = Gynostemma pentaphyllum (Thbg.) Makino, 15:27
— *rigida* Lévl. & Vant. = Ampelopsis Delavayana Planch. 15:24
— *rubrifolia* Lévl. & Vant. = Parthenocissus himalayana (Royle) Planch. var. rubrifolia (Lévl. & Vant.) Gagnep. 15:22
— *Seguini* Lévl. = Iodes Seguini (Lévl.) Rehd. 15:3
— *Seguini* Lévl. (1914) p. p. = Iodes ovalis Bl. 15:2; 18:276
— *Taquetii* Lévl. = Parthenocissus tricuspidata (Sieb. & Zucc.) Planch. 15:23
Webera Cavaleriei Lévl. = Tarenna incerta Koord. & Val. 16:321; 18:248
— *Henryi* Lévl. = Tarenna incerta Koord. & Val. 16:321; 18:248
— *Marchandii* Lévl. = Daphniphyllum macropodum Miq. 14:234
Wendlandia Cavaleriei Lévl. 16:318
— *Dunniana* Lévl. = W. uvariifolia Hce. subsp. Dunniana (Lévl.) Cowan, 16:318; 18:247
— *Feddei* Lévl. = W. Cavaleriei Lévl. 16:318
Wikstroemia *Bodinieri* (Lévl.) Lévl. [=*Alyxia Bodinieri* (Lévl.) Woods. 15:316] = A. Schlechteri Lévl. 18:235, 300
— *Hemsleyana* Lévl. = Alstonia Mairei Lévl. 15:315; 18:235
— salicina (Lévl.) Lévl. & Blin, 15:104
— *Valbrayi* Lévl. = W. indica (L.) C. A. Mey. 15:103
Wrightia Schlechteri Lévl. 15:312; 18:238, 361
Xanthoceras enkianthiflora Lévl. = Staphylea holocarpa Hemsl. 15:1
Xylosma *Dunniana* Lévl. = Xylosma racemosum var. kwangtungense (Metcalf) Rehd. 15:102

Xylosma *racemosa* "Miq." ex Lévl., vix Miq. = X. racemosum var. kwangtungense (Metcalf) Rehd. 15:102
Zanthoxylon *Argyi* Lévl. = Z. simulans Hance, 14:223
— *Bodinieri* Lévl. = Z. dissitum Hemsl. 14:224
— Chaffanjoni Lévl. 14:223; 18:210
— *Esquirolii* Lévl. = Z. stenophyllum Hemsl. 14:223
— *odoratum* (Lévl.) Lévl. 14:224 = Z. rhetsioides Drake, 18:209
— *oxyphyllum* "Edge." ex Lévl. non Edgen. = Z. Chaffanjoni Lévl. 14:223
Zenobia cerasiflora Lévl. = Enkianthus chinensis Franch. 15:279; 18:230
Zizyphus Esquirolii Lévl. = Hovenia dulcis Thunb. 15:17

Arnold Arboretum
Harvard University

REINSTATEMENT AND REVISION OF CLEISTOCALYX BLUME (INCLUDING ACICALYPTUS A. GRAY), A VALID GENUS OF THE MYRTACEAE

E. D. Merrill and L. M. Perry

With plate 215

The genus *Cleistocalyx*, proposed by Blume, Mus. Bot. Lugd.-Bat. **1**: 84. 1849, with two species, *C. nitidus* Blume and *C. nervosus* Blume, very soon (Miq. Fl. Ind. Bat. **1**(1): 442. 1855) dropped into synonymy under *Eugenia* (Micheli) Linnaeus, and has since remained more or less in obscurity. The reasons for this are various. Generic lines are somewhat uncertainly drawn in the Myrteae, and *Cleistocalyx* is but one of several genera proposed by Blume which most modern authors have included in *Eugenia* Linn. *sensu latiore*. The latter, thus interpreted, is admittedly heterogeneous, including not only the American forms, section *Eueugenia*, but also *Jambosa* DC., *Syzygium* Gaertn. and other proposed segregates, which may or may not be separable by definite generic characters.

Cleistocalyx is known to most workers only by the original generic description and that of the type-species. In both the generic and the specific descriptions, although Blume's paper is illustrated by an excellent plate, the description of the outstanding character of the genus is partly misleading, "Calyx . . . limbo supero, primum clauso, sub anthesi in lobos 4 v. 5 irregulares longitudinaliter fisso, deciduo." The closed calyces are easily found in an inflorescence with buds, yet of these, none in our material open by splitting longitudinally into four or five irregular lobes, but rather by an irregular transverse dehiscence (really a rupturing of the tissue) between the calyptra and the rest of the calyx, often leaving a ragged margin which, in older flowers of more than one species, has led botanists to describe the calyx as lobed; cf. descriptions of *C. barringtonioides* (Ridl.), *C. nicobaricus* (King) and *C. operculatus* (Roxb.). This evidence would have been sufficient to place *Cleistocalyx* beyond consideration as the proper generic name for the calyptrate species of "*Eugenia*," except that Merrill, in his study of the Bornean types of *Eugenia* at the Rijks Herbarium in 1930, had written on one of the specimens which he had with him for comparison, "This *is* Jambosa nitida Korthals." *Jambosa nitida* Korth. is the basis of *Cleistocalyx*

nitidus Blume and hence the standard-species of the genus. Bentham, Jour. Linn. Soc. **10**: 165. 1869, intimated that Blume's description may have been drawn from something "accidental in a single detached calyx, or even conjectural; for, if well ascertained as an essential character, it would have been represented in the figure (of *C. nitidus* Blume)." Through the kindness of Professor H. J. Lam, Rijks Herbarium, we have since had the privilege of re-examining the type-collection of *Jambosa nitida* Korth. and of verifying the previous identification; the specimens show immature inflorescences and fruits, no flower even approaching anthesis, and, so far as we can see, no evidence of the longitudinal splitting which Blume described. It may be that Blume was influenced in his description of the calyx-lobes by his erroneous inclusion of *Eugenia nervosa* Lour. in *Cleistocalyx,* as Loureiro definitely described his species as having 4-lobed calyces. In all our specimens representing species of this group the circumscissile calyptra is entire after separation and, at least in early anthesis, remains attached at one side and this is the case with *Jambosa nitida* Korth. = *Cleistocalyx nitidus* Blume. The one constant character by which *Cleistocalyx* can always be distinguished from *Eugenia, sensu latiore,* and from the numerous Old World species of *Syzygium* and *Jambosa* is in its calyptrate calyces, the undivided, often more or less indurated upper parts of which fall as a lid. Blume's detailed illustration of *Cleistocalyx nitidus* (Korth.) Blume shows the undifferentiated calyptra with no indication whatever of calyx-lobes.

Miquel's treatment of the genus *Eugenia* contains four sections, the third of which is characterized thus, "Thyrsi terminales. Calycis tubus e basi leviter constrictâ semi-globosus, limbus in alabastris valde juvenilibus concreto-clausus, dein in lacinias 4–5 fissus." This is comparable to the extract from Blume's generic description above quoted; moreover, the section has only one species, *Eugenia nervosa* Lour., with *Cleistocalyx nervosus* Blume and *C. nitidus* Blume in synonymy. It is not clear to us why both Blume and Miquel should place a species with calyx described as "superus, 4-partitus, magnus: laciniis, obtusis, concavis" (Lour. Fl. Cochinch. **1**: 308. 1790), in a section or genus featuring the upper part of the calyx entirely closed; yet, since Loureiro's type is not extant we can only point out what appears to be a discrepancy. Further, Miquel certainly erred in reducing *Cleistocalyx nitidus* Blume to *Eugenia nervosa* Lour.

After reducing *Cleistocalyx* to *Eugenia,* Miquel, op. cit. 460, established the section *Symphysion* in the genus *Syzygium* on the following basis, "calyx adultus vertice membranaceo totus occlusus, tanquam operculum demum inferne lacerum cum operculo corollino (quod proprium

haud discernendum) ut videtur intime connatum circumscisse dejectum." The floral feature here delineated is the distinctive character of *Cleisto calyx* (Pl. 215). Miquel described two species, *Syzygium occlusum* Miq. and *S. javanicum* Miq. and added a note on *S. fruticosum* DC. Although our material of the first, *Horsfield 10,* is a mixture of branchlets bearing both flowers and leaves, and of separate inflorescences, the latter are not distinguishable from those of *C. operculatus* (Roxb.); we cannot say from the fragmentary type of *S. javanicum* Miq. whether it is characterized by an operculate calyx or not, but the description surely indicates this group. The observation on *S. fruticosum* DC., as we understand the species, should be excluded.

In 1854, A. Gray, Bot. U. S. Expl. Exped. **1**: 551, established the genus *Acicalyptus* for a species from the Fiji Islands with a very distinctive subulate-operculate quadrangular calyx. He indicated that its probable relationship was with *Calyptranthes* or *Eucalyptus,* depending on whether the fruit, then unknown, was a berry or a capsule. Among Seemann's collections from Fiji he found a second species with a short-apiculate calyptra. Seemann himself discovered a third species with the fruit a berry and the calyptra "just as it is in the ordinary American *Calyptranthes,*" and therefore reduced *Acicalyptus* A. Gray to *Calyptranthes* Swartz. Bentham, op. cit. 144, discussing *Acicalyptus* pointed out that the seed was unknown but that the habit and the arrangement of the petals of Seemann's species, *C. eugenioides,* were more like those of *Eugenia* than of *Calyptranthes.* Later, under *Cleistocalyx,* he noted that its bud was that of *Acicalyptus* and if the latter should "really prove to have a Eugenioid embryo, it might be united with *Cleistocalyx* in a genus closely allied to *Eugenia* but differing . . . by the operculate calyx." Baron von Mueller, Bot. Centralbl. **28**: 149. 1886, also pointed out that "it would appear, that *Acicalyptus* ought to be reduced to *Cleistocalyx,* published five years earlier by Blume." ¶In his Second Systematic Census of Australian Plants, pt. 1. 102. 1889, he lists *Acicalyptus* thus, "Calyptranthes partly, Cleistocalycis subgenus," showing that he was still convinced of their very close relationship.

We now have *Acicalyptus myrtoides* A. Gray in fruit, collected by Gillespie and described by him, Bishop Mus. Bull. **83**: 21, *f. 25.* 1931. We find it necessary to emend his description from "endosperm . . ." to: cotyledons two, large and hemispherical enclosing the hypocotyl and epicotyl attached near the centre of each of the opposing faces of the cotyledons, hypocotyl exceeding epicotyl in length; and correspondingly, on his legend of *f. 25,* we prefer the following: *a,* enlarged embryo showing cotyledons separated from hypocotyl and epicotyl; *b, c,* plantlet

minus cotyledons much enlarged. Fruits of the other Fijian species which are represented by herbarium material are similar. All are ellipsoid or oblong with the angles of the calyx (usually appearing as a narrow ridge) more or less marked on the fruit. The structure of the embryo, so far as we can interpret it from dried and immature fruits, does not differ materially from the general type of that in *Cleistocalyx*: cotyledons with the two opposing and almost flat or concave (perhaps from shrinkage) faces attached to the minute hypocotyl and epicotyl. A variation in the type appears in *C. operculatus* (Roxb.) and *C. Fullageri* (F. v. Muell.); the embryo of these consists of two cotyledons with *interlocking* faces attached near the middle with a long hypocotyl between, extending from the point of attachment near the centre to the outer surface of the embryo (Pl. 215, f. 32, 43). Possibly we might be inclined to look upon these as two distinct types of embryo were it not for the fact that in *Syzygium* these two extremes blend to such an extent that it is impossible to distinguish the two except in the extremes as shown in this genus.

With only the original species, *A. myrtoides* A. Gray, at hand, the smooth and sharply angled calyx and the long rostrate calyptra appear very distinctive; but, with more material for comparison, these are manifestly the extreme form of the characters of the genus and, only when modified, applicable to species which must be considered congeneric; furthermore, the several species placed herein are separable from *Cleistocalyx* only by two minor characters, the angular calyx and to a less degree the angular and elongated fruit. These are good sectional characters but scarcely of generic worth; hence, we find ourselves unable to maintain the genus *Acicalyptus* A. Gray as distinct from *Cleistocalyx* Blume, the latter having nomenclatural precedence. However, since the Fijian species apparently represent a natural group distinguished by the angular calyx and the less angled and elongated fruit, we propose to treat *Cleistocalyx* as having two fairly distinct sections, ACICALYPTUS (A. Gray) and EUCLEISTOCALYX, the latter to include all species characterized by a terete calyx and globose to subglobose, rarely somewhat elongated, but not angled, fruit.

As we have already stated, the genus *Eugenia* in its broadest sense includes many diverse forms. From these we propose to segregate those species with calyptrate calyces, re-establishing the genus *Cleistocalyx* to take care of what we believe to be a distinct entity worthy of generic rank. *Acicalyptus* was originally known only from Fiji but later species were described from New Caledonia and Lord Howe Island. *Cleistocalyx* was described from a Bornean specimen. As we now interpret Blume's

genus, *Acicalyptus* falling as a synonym, the group is represented by twenty-one species extending from Chittagong, Burma, Indo-China, Hainan and southeastern China to Sumatra, Java, Borneo, the Philippines, New Guinea, northern Australia, Lord Howe Island, New Caledonia and Fiji. Thus, instead of *Acicalyptus* A. Gray being a "Polynesian" genus, *Cleistocalyx* Blume as we interpret it is primarily an Indo-Malaysian one that has extended to Fiji.

This study is based primarily on the material in the herbaria of the Arnold Arboretum, Gray Herbarium, New York Botanical Garden, and the Botanical Garden at Buitenzorg, with special loans of essential specimens from the Washington, Kew, Leiden, Utrecht, Brisbane, and Melbourne herbaria. To the administrative heads of the institutions involved we are under obligations for the courtesies extended in the loan of important material essential to this study. The actual preparation of the paper was rendered possible through a grant from the Milton Fund of Harvard University. The primary purpose of this grant was to make possible a general study of the Bornean species of *Eugenia*, but as the latter study developed it was found desirable to recognize certain generic segregates. In two cases we have found it expedient to segregate certain species from EUGENIA (including *Jambosa* and *Syzygium*) and to recognize these as of generic rank. Thus it became necessary to examine all recognized species in each group for the entire geographic range of the unit, as generic limits could not with safety be determined solely on the basis of the Bornean species alone. In this paper we consider the recognized species in the first of these two groups.

Cleistocalyx Blume, Bot. Mus. Lugd.-Bat. **1**: 84. 1849.

Acicalyptus A. Gray, Bot. U. S. Expl. Exped. **1**: 551. 1854.
Eugenia § 3, Miq. Fl. Ind. Bat. **1** (1): 442. 1855.
Syzygium § *Symphysion* Miq. op. cit. 460, excl. *Syzygium fruticosum* DC.
Calyptranthes sensu Seemann, Fl. Vit. 81. 1865, non Swartz.
Acicalyptus (*Calyptranthes* partly, *Cleistocalyx* subgenus) F. v. Mueller, Second Syst. Census Austral. Pl. pt. **1**: 102. 1889.

KEY TO SPECIES

A. Calyx-tube definitely 4-angled; fruit ± obscurely 4-angled, crowned by the very narrow but usually deep limb of the calyx (section *Acicalyptus*: Fiji).
  B. Calyptra subulate-rostrate; fruit 4-ridged ....1. *C. myrtoides*.
  B. Calyptra not subulate-rostrate, ± conical and obtusely apiculate.
    C. Leaves elliptic to oblong or ovate, apex distinctly acuminate.
      D. Flowers obviously pedicellate, pedicels up to 3 mm. long. 2. *C. longiflorus*.

D. Flowers sessile or, in part, very short-pedicellate, pedicels not longer than 1 mm.

E. Submarginal veins 2, the inner 2–3 mm. within the margin; flower-buds 3.5–4 mm. long. ......3. *C. ellipticus.*

E. Submarginal vein 1 mm. within the margin; flower-buds 4.5–6 mm. long (more attenuate toward base than in *C. ellipticus*) ....4. *C. Seemanni.*

C. Leaves obovate, apex obtuse or rounded ......5. *C. eugenioidcs.*

A. Calyx-tube terete and smooth, ± wrinkled-sulcate on drying; fruit not angled, crowned by the broad and usually ± shallow limb of the calyx (section *Eucleistocalyx*).

F. Flowers long, calyx-tube (after calyptra has fallen) ± 18 mm. long (Lord Howe Island) ....6. *C. Fullageri*

F. Flowers shorter, calyx-tube (after calyptra has fallen) usually not exceeding 12 mm. long.

G. Inflorescence axillary and terminal.

H. Venation open, primary veins 5 mm. or more apart, secondary veins often obvious but not as prominent as the primary ones.

I. Leaves rounded or slightly cordate at base, practically sessile ....7. *C. paradoxus.*

I. Leaves obtuse or cuneate at base, or if somewhat rounded, distinctly petiolate.

J. Branchlets 4-angled.

K. Midrib somewhat sharply keeled on lower surface; leaves thinly coriaceous, copiously pellucid-punctate; submarginal vein ± 1 mm. within the margin (New Guinea) ....8. *C. Baeuerlenii.*

K. Midrib roundish, not keeled, on lower surface; leaves coriaceous, obscurely, if at all, pellucid-punctate; submarginal vein 2–4 mm. within the margin.

L. Inflorescence short (3–5 cm. long) and compact; leaves densely glandular-puncticulate beneath; primary veins impressed above, sharply prominent beneath (Borneo). 9. *C. perspicuinervius.*

L. Inflorescence longer (up to 15 cm.) and open; leaves obscurely puncticulate; primary veins not impressed above, prominent beneath.

M. Leaves narrowly oblong; flowers with a long pseudostalk [5–7(–9) mm.] (Borneo). 10. *C. barringtonioides.*

M. Leaves oblong-elliptic; flowers with a short pseudostalk [± 2.5 mm. long] (Borneo). 11. *C. nitidus.*

J. Branchlets terete or sulcate.

N. Leaves acuminate and often twisted at the apex.

O. Submarginal veins not more than two, the inner usually not more than 4 mm. within the margin; calyptra mostly short-apiculate.
P. Flowers with a long pseudostalk (5–7 mm.); leaves narrowly oblong (Borneo).
10. *C. barringtonioides.*
P. Flowers with a short pseudostalk (2.5–3 mm.); leaves oblong- to narrowly ovate-elliptic.
Q. Leaves oblong-elliptic; secondary venation manifest but not obvious.
R. Leaves 10–20 cm. long; primary veins 15–22; secondary submarginal vein mostly obscure (Borneo).
11. *C. nitidus.*
R. Leaves 8–12 cm. long; primary veins 8–13; secondary submarginal vein present (Philippines).
12. *C. arcuatinervius.*
Q. Leaves broad- to ovate-elliptic; secondary venation obvious and tending to be prominent (Indo-China).
13. *C. retinervius.*
O. Submarginal veins often more than two (three in larger leaves), the inner (usually prominent) 4–7(–12) mm. within the margin; calyptra conspicuously apiculate or short-rostrate (Queensland)...14. *C. gustavioides.*
N. Leaves obtuse or rounded with a short and abrupt acumen.
S. Branchlets light-brown or grayish; petiole ± 2 cm. long; leaves with large and scattering pellucid punctations; ultimate branchlets of inflorescence narrowly winged (Hainan).
15. *C. conspersipunctatus.*
S. Branchlets whitish; petiole less than 1 cm. long; leaves minutely puncticulate, not pellucid; ultimate branches of the inflorescence compressed or obscurely angled (Borneo).
16. *C. leucocladus.*
H. Venation close, primary veins scarcely 2 mm. apart (*C. Brongniartii* not seen, but described as "creberrime penninervia").
T. Leaves subcaudate-acuminate (Philippines).
17. *C. paucipunctatus.*
T. Leaves abruptly short-acuminate to obtuse.
U. Leaves distinctly petiolate; calyptra not sulcate (Indo-China) ....18. *C. nigrans.*
U. Leaves sessile or very short-petiolate; calyptra sulcate (New Caledonia) ....19. *C. Brongniartii*

G. Inflorescence lateral in the axils of old or fallen leaves below the new leafy shoots, rarely axillary and terminal.
V. Petiole short (5–8 mm. long) and thickish, the older often of the same color as the branchlets (whitish-gray); leaves chiefly obtusish; calyx-tube abruptly narrowed into short pseudostalk (Borneo) .... 16. *C. leucocladus.*
V. Petiole longer (1–2 cm. long) and not thickened; branchlets gray to brownish; leaves obtusely short-acuminate; calyx-tube gradually tapering to the base.
W. Calyx-tube broadly attenuate at the base; primary veins of leaves obvious; inflorescence with many branches and numerous flowers (southern China, Indo-Malaysia and northern Australia) .... 20. *C. operculatus.*
W. Calyx-tube scarcely attenuate at base; primary veins of leaves inconspicuous; inflorescence with few branches and sparsely flowered (Nicobar Islands). 21. *C. nicobaricus.*

1. **Cleistocalyx myrtoides** (A. Gray), comb. nov. Pl. 215, f. 6–8.

Acicalyptus myrtoides A. Gray, Bot. U. S. Expl. Exped. **1**: 551. *t. 67.* 1854, Bonplandia **10**: 35. 1862; Drake, Ill. Fl. Mar. Pacific. 168. 1890; Gillespie, Bishop Mus. Bull. **83**: 20. *f. 25.* 1931.
Calyptranthes myrtoides Seemann, Fl. Vit. 81. 1865.

Fiji: *Herb. U. S. Expl. Exped. 1838–42* (type-collection of *A. myrtoides*); Viti Levu, Tholo North Province, Nandarivatu, *Gillespie 3971*, stream-bed down the escarpment north of Government Station.

This species is readily separable from the others, which we have seen, by the strongly angled calyx which does not wrinkle much on drying, and by the subulate-rostrate beak of the calyptra. In 1886, Baron von Mueller, Bot. Centralbl. **28**: 149, stated, "Regretably the name Acicalyptus, derived from an exceptional characteristic of the original species discovered, does not apply to most of the other forms, which must be considered congeneric." That is still true for the specimens which we have examined.

2. **Cleistocalyx longiflorus** (A. C. Smith), comb. nov. Pl. 215, f. 1–2.

Acicalyptus longiflora A. C. Smith, Bishop Mus. Bull. **141**: 109, *f. 57.* 1936.

Fiji: without definite locality, *Storck s. n.*, June, 1883 (type-collection of *A. longiflora*); Viti Levu, *Gillespie 2277*, August 15, 1927, slopes of Korombamba mountain, at 300 m. alt.; Viti Levu, *Gillespie 3962*, Nandarivatu, secondary wood, valley of the Singatoka.

Not very closely related to the other Fijian species. In its foliar characters *C. longiflorus* is most like *C. ellipticus* (A. C. Smith); in the angularity of the calyces it approaches *C. myrtoides* (A. Gray); but, in

size of flowers and characters of the calyptra, it is unquestionably nearest *C. Seemanni* (A. Gray).

3. **Cleistocalyx ellipticus** (A. C. Smith), comb. nov. Pl. 215, f. 9.

Acicalyptus elliptica A. C. Smith, Bishop Mus. Bull. **141**: 107, *f. 57.* 1936.

FIJI: southern portion of Seatovo Range, *A. C. Smith 1567*, April 20–May 2, 1934, ridge forest at 100–350 m. alt. (type of *A. elliptica*).

Perhaps most closely related to *Cleistocalyx Seemanni* (A. Gray) from which it is separable by the larger leaves and the flowers slightly smaller and less narrowed toward the base.

4. **Cleistocalyx Seemanni** (A. Gray), comb. nov. Pl. 215, f. 3–5.

Acicalyptus Seemanni A. Gray, Bonplandia **10**: 35. 1862; Drake, Ill. Fl. Mar. Pacific. 168. 1890; A. C. Smith, Bishop Mus. Bull. **141**: 107. 1936.

Calyptranthes Seemanni Seemann, Fl. Vit. 81. 1865.

Eugenia prora Burkill, Kew Bull. **1906**: 4. 1906.

FIJI: *Seemann 168* (type of *A. Seemanni*); Mount Mbuke Levu, *A. C. Smith 241;* Mount Ndikeva, *A. C. Smith 1876;* Viti Levu, *Gillespie 2866,* ridges southeast of Namosi village on the overland trail to Navau at 600 m. alt.; without definite locality, *Horne 774.*

The two collections *Gillespie 2866* and *Horne 774* have slightly glandular-punctate leaves.

4a. **Cleistocalyx Seemanni** var. **punctatus,** var. nov.

A typo differt foliis utrinque dense minuteque subpustulato-glandulosis, calycibus leviter pustulatis.

FIJI: without definite locality, *Graeffe s. n.* (type, Gray Herb.).

The glands of the leaves are so abundant that the secondary venation is more or less obscure, the flowers too are minutely pustulate and the operculum is scarcely apiculate.

5. **Cleistocalyx eugenioides,** nom. nov.

Calyptranthes eugenioides Seemann, Fl. Vit. 81. 1865, non Cambessed., in St. Hilaire, Fl. Bras. Merid. **2**: 370. 1829.

Acicalyptus eugenioides Drake, Ill. Fl. Mar. Pacific. 168. 1890; Niedenz. in Engler & Prantl, Nat. Pflanzenfam. **3**(7): 86. 1893.

FIJI: Viti Levu, Nadarivatu, *Gillespie 4335,* December 13, 1927, summit of Loma laga, at 1200 m. alt.

When Seemann described this species he noted the similarity in habit to that of *Eugenia confertiflora* A. Gray. Gray had already pointed out that Seemann's collection had longer leaves less pale beneath, larger flowers with longer and striate-angled calyx-tubes, but he did not describe

it, probably because he had inadequate material, for he stated, "the means of comparison are not complete." We have not yet found the material which Gray had for comparison, nor have we seen any representative of this species except the specimen above cited. It is easily separated from the other Fijian members of *Cleistocalyx* by its obovate leaves.

6. **Cleistocalyx Fullageri** (F. v. Muell.), comb. nov.
Pl. 215, f. 29–33.

Acicalyptus Fullageri F. v. Muell. Fragm. Phytogr. Austral. **8**: 15. 1873, **9**: 193. 1875; Moore, Census Pl. New S. Wales, 28. 1884, Handbk. Fl. New S. Wales, App. **1**: 519. 1893; Hemsl. Ann. Bot. **10**: 236. 1896; Maiden, Proc. Linn. Soc. New S. Wales, **23**: 129. 1898; Oliver, Trans. New Zeal. Inst. **49**: 144, *f. 1a.* 1917.

LORD HOWE ISLAND: authentic specimen, without data; *Moore, Fullagar & Lind* (type, Melbourne Nat. Herb., not seen).

The specimen generously donated to our collection by Mr. F. J. Rae, Director of the Melbourne Botanic Gardens, has greatly aided us in our interpretation of this species. Although Baron von Mueller gave a very detailed description of *A. Fullageri,* pointing out how it differs chiefly from its Fijian allies, we here add a short summary of the distinctive characters: Very long flowers (Pl. 215, f. 30), the mature calyx-tube ± 18 mm. long, the longest known in the genus; ellipsoid or somewhat pyriform fruits; short-petiolate obovate, obtuse leaves, and branchlets ± angled or sulcate. *C. Fullageri* (F. v. Muell.) appears to be more closely connected with § *Eucleistocalyx* than with § *Acicalyptus,* although it is very distinct within the genus.

The collector's name is given as Fullagar, but F. von Mueller in the binomial used the form *Fullageri* which we accept; other authors cited use the form *Fullagari.*

7. **Cleistocalyx paradoxus** (Merr.), comb. nov. Pl. 215, f. 37–38.

Eugenia paradoxa Merr. Jour. Str. Branch Roy. As. Soc. **77**: 210. 1917, Enum. Born. Pl. 432. 1921.

BORNEO: Sarawak, without locality, *Native collector 365* (type of *E. paradoxa* Merr.); near Kuching, *Haviland 2327/1832*: Dutch Borneo, Soengei Sambas, *Hallier 1160;* Soengei Landak, *Teysmann s. n.;* Pontianak, *Teysmann s. n.;* Kapuas, *Teysmann 8224;* without locality, *Teysmann?;* near Poetat, *Mondi 54.*

The only species of the genus known to us with rounded or slightly cordate, practically sessile leaves.

8. **Cleistocalyx Baeuerlenii** (F. v. Muell.), comb. nov. Pl. 215, f. 21.

Eugenia Baeuerlenii F. v. Muell. Australas. Jour. Pharm. June, 1886, Bot. Centralbl. **28**: 149. 1886; Diels, Bot. Jahrb. Engler **57**: 379. 1922.

NEW GUINEA: Strickland River, *Baeuerlen s. n.* (type); Fly River (Branch), *Baeuerlen 538,* November, 1885.

Diels, l. c. (Die Myrtaceen von Papuasien), merely notes that the description of *Eugenia Baeuerlenii* F. v. Muell. was insufficient to determine its place within the genus (*Jambosa*).

Mr. F. J. Rae, Director of the Melbourne Botanic Gardens very kindly loaned for our study the two specimens cited above. In general aspect the species is very distinct; the venation of the leaves approaches subtransverse, the blade is somewhat reddish-brown, shining, and, although it is scarcely, if at all, punctate, against a strong light it is copiously pellucid-dotted. The calyx is cupulate with a pseudostalk and dries with distinct ridges.

9. **Cleistocalyx perspicuinervius** (Merr.), comb. nov.
Pl. 215, f. 10–11.

Eugenia perspicuinervia Merr. Univ. Calif. Pub. Bot. **15**: 218. 1929.

BORNEO: British North Borneo, Tawao, *Elmer 20600, 21682* (type of *E. perspicuinervia* Merr.).

A species which suggests *C. nitidus* Blume in the large and prominently veined leaves, but which is easily distinguished by its short (up to 5 cm. long) and few-flowered axillary and terminal inflorescences.

10. **Cleistocalyx barringtonioides** (Ridl.), comb. nov.
Pl. 215, f. 25–28.

Eugenia barringtonioides Ridl. Jour. Bot. **68**: 12. 1930.

BORNEO: British North Borneo, without definite locality, *Villamil 406,* on river banks; Tenom, *Tahir 787;* Lokan River, *Evangelista 906;* Sandakan, *Panching 817;* Pangie, Beaufort, *Bakar (B. N. B. Forestry Dept. 2472),* river-bank; Melobang, *Balajadia (B. N. B. Forestry Dept. 2849),* plain, sea level: Sarawak, Trusan, *Haviland 52/118;* Upper Baram, Sio Malit, *Moulton 6740* (type-collection of *E. barringtonioides* Ridl.): Dutch Borneo, Sedalir, *Amdjah 248;* Batoe Oeloe Seboekoe, *Amdjah 527;* Gunong Djempanja *Amdjah 734;* Western Koetai, near Batoe Bong, *Endert 2195;* near Boloet, *Endert 4042.*

A distinctive species of river-banks readily recognized at anthesis by the open panicles bearing flowers with long (5–7(–9) mm.) pseudostalks and long (± 2 cm.) stamens. The leaves are mostly lanceolate or narrowly oblong.

Eugenia barringtonioides Ridl. was based on *Moulton 6740* from

Upper Baram, indicated by Ridley as *Jambosa*. He describes the calyx as having "lobis obscuris brevibus, rotundatis." This statement applies to the persistent fragments of the calyptrate calyx, as an examination of the type shows that in the bud the calyx has a calyptra which breaks off and falls as a whole, leaving a torn irregular margin which was misinterpreted by Ridley as calyx-lobes.

11. **Cleistocalyx nitidus** Blume, Mus. Bot. Lugd.-Bat. **1**: 84, *f. 56.* 1849. Pl. 215, f. 19–20.

Jambosa nitida Korth. Nederl. Kruidk. Arch. **1**: 202. 1847, non Cambessed. et al.

Eugenia nervosa sensu Miq. Fl. Ind. Bat. **1** (1): 442. 1855, non Lour.

Eugenia cleistocalyx Merr. Philip. Jour. Sci. Bot. **13**: 98. 1918, Enum. Born. Pl. 427. 1921.

BORNEO: British North Borneo, Tawao, *Elmer 20836, 21702;* Kinabatangan, *Evangelista 861;* Lihak, *Agullana (B. N. B. Forestry Dept. 1946)*, plain: Sarawak, Rejang, Kapit, *Haviland 2921*: Dutch Borneo, Kampong Lemoe, Taloek Gansioeng forest, Oeloe Doesoen, *Dachlan 2407;* Soengei Magne, *Jaheri 664;* Soengei Tepoetiz, *Jaheri 901;* Banjermasin, Mount Bahay, *Korthals s. n.* (carbon imprint of leaf; type, Rijks Herb.); *Winkler 3744.*

This, the type-species of the genus *Cleistocalyx*, and *C. barringtonioides* (Ridl.) very closely resemble each other but apparently are distinct. *C. nitidus* Blume differs in having broader leaves and the flowers, with short (2–3 mm. long) pseudostalk and short anthers, closely clustered at the tips of the branches of the inflorescence. The collection from Lihak differs somewhat in its narrowly winged branchlets and its very shiny and pale brown leaves.

12. **Cleistocalyx arcuatinervius** (Merr.), comb. nov. Pl. 215, f. 16–18.

Eugenia arcuatinervia Merr. Philip. Jour. Sci. **1**: Suppl. 104. 1906; C. B. Rob. Philip. Jour. Sci. Bot. **4**: 380. 1909; Elmer, Leafl. Philip. Bot. **4**: 1418. 1912; Merr. Enum. Philip. Pl. **3**: 158. 1923.

PHILIPPINE ISLANDS: Luzon: Bataan Province, Lamao River, Mount Mariveles, *Whitford 1227, Meyer (For. Bur. 2598);* Cagayan Province, *Klemme (For. Bur. 6669), Barros (For. Bur. 21760, 21777), Fischer (For. Bur. 21747);* Laguna Province, *Mabesa (For. Bur. 23792);* Rizal Province, *Maneja (For. Bur. 23963);* Sorsogon Province, Irosin, *Elmer 16220;* Mindoro, *Ramos (Bur. Sci. 39380);* Leyte, *Wenzel 726, 755, 886, 1524;* Mindanao, Surigao Province, *Wenzel 2661, 2787, 2960, Sherfesee, Cenebre & Ponce (For. Bur. 21664).*

There is a pronounced resemblance between this species and *C. nitidus*

Blume. Technically *C. arcuatinervius* (Merr.) may be distinguished by its foliar characters. The leaves are smaller and long-acuminate, the primary veins are fewer and a secondary submarginal nerve is always present.

13. **Cleistocalyx retinervius**, sp. nov. Pl. 215, f. 12–15.

Arbor parva; ramulis ultimis fuscis, teretibus vel ad nodos leviter compressis, 2–3 mm. diametro; foliis ellipticis vel oblongo-ovatis, 9–14 cm. longis, 5.5–7 cm. latis, basi late obtusis, fere rotundatis, apice late obtuseque acuminatis et recurvis, epunctatis, olivaceis vel atro-brunneis, subtus pallidioribus vel rubro-brunnescentibus, costa supra impressa subtus leviter elevata, venis primariis perspicuis numerosis 4–8 mm. remotis patulis, plerumque ad marginem leviter curvatis, vena intramarginali (interdum duplici) 2–3 mm. a margine conjunctis, venulis laxe reticulatis perspicuis; petiolo circiter 1.5 cm. longo, nigrescente vel brunneo, transverse ruguloso; inflorescentiis terminalibus axillaribusque, ramis brevibus, floribus ± confertis, sessilibus, alabastris ± 7 mm. longis, apice ovoideo-globosis, basi stipitatis; calyce in alabastro clauso leviter apiculato, per anthesin calyptriformi-circumscisso, marginem subintegrum relinquente, petalis liberis?, staminibus numerosis, antheris ellipticis; fructibus subglobosis, circiter 1.5 cm. diametro, apice calycis limbo coronatis.

INDO-CHINA: Annam, Tourane and vicinity, *Clemens 3777* (type), 3395, May–July, 1927, in thickets near the seashore. The holotype is in the herbarium of the Arnold Arboretum, with isotypes in the New York and Washington herbaria.

Although this species was collected in a region where *Eugenia nervosa* Lour. might be expected to occur, we have carefully compared the description with our material of which we have both flowers and fruit, and we particularly note the following discrepancies between *Eugenia nervosa* Lour. and *Cleistocalyx retinervius* Merr. & Perry both in the calyx and in the fruit. In the former, the calyx is lobed, the fruit "nervosa" (probably the equivalent of *ribbed*); in the latter, the calyx is calyptrate and the fruit is practically smooth.

14. **Cleistocalyx gustavioides** (F. M. Bail.), comb. nov. Pl. 215, f. 50–53.

Eugenia gustavioides F. M. Bailey, Queensl. Agric. Jour. **5**: 389. 1899; J. F. Bailey, Queensl. Agric. Jour. **5**: 399, *t. 140*. 1899; F. M. Bailey, Queensl. Fl. **2**: 658. 1900, Cat. Queensl. Pl. 208. 1913.

AUSTRALIA: Queensland, without data, *J. F. Bailey s. n.* (type); near Lake Barrine, Atherton Tablelands, *J. F. Bailey s. n.* (fruit only);

Atherton Tableland, Range Road, *Kajewski 1185;* Forest Reserve 310, Galgarra, *Dreghorn s. n.;* Daintree River, *Brass 2256, Kajewski 1398.*

Mr. C. T. White, government botanist at Brisbane, has obligingly loaned us the type and Dreghorn's collection, also the fruit; these are the only specimens of this species at Brisbane apart from the other collections above cited.

The leaf-venation of this species is rather unusual. The largest and most conspicuous intramarginal vein is from 4 to 7 (to 12) mm. within the margin; in the blade between may be found one (or sometimes two) similar vein(s), the outer(most) being the fainter(est) and 1 to 2 mm. within the margin. The fruit available is fully mature (Pl. 215, f. 50, 51). J. F. Bailey noted that he picked this up under a tree. Only a fragment of the hypocotyl remains, but unquestionably the fruit is similar in structure to that found in a large number of species of *Syzygium.*

15. **Cleistocalyx conspersipunctatus,** sp. nov. Pl. 215, f. 34–36.

Arbor 15–40 m. alta, glabra; ramulis novellis obscure tetragonis, demum teretibus vel compressis, brunneo-viridibus; foliis obovato-ellipticis, basi cuneatis, apice rotundatis, acumine brevi obtusoque, 5–13 cm. longis, 3–7 cm. latis, consperse pellucido-punctatis (glandulis magnis, interdum sine lente manifestis), costa supra impressa subtus prominula, venis primariis utrinque perspicuis, 4–8 mm. remotis, ad marginem anastomosantibus, venulis laxe reticulatis; petiolo 1.5–2 cm. longo, gracili, ruguloso; inflorescentiis terminalibus axillaribusque, 7–10 cm. longis, rachide quadrangulari, ramulis tetrapteris; alabastris sessilibus, 7 mm. longis 4.5 mm. diametro, apice globosis basi breviter stipitatis, consperse glanduloso-pustulatis; calyce clauso, apice breviter apiculato, parte superiore sub anthesi circumscisse decidua, antheris 0.6–0.8 mm. longis, ellipticis, glanduloso-mucronatis; fructibus subglobosis, immaturis 1.5–2 cm. diametro.

China: Hainan, without locality, *Wang 33524, 33687, 34214,* in mixed woods, August and September, 1933; Po-ting, *How 73248, 73332* (type); Ah Ping, *Chun & Tso 44145,* October 24, 1932, in forested ravine, about 900 m. alt.; Yaichow, *Liang 62200,* July 19, 1933, in forests. The holotype is preserved in the Arnold Arboretum herbarium.

This species is readily distinguished from *C. operculatus* (Roxb.), the other known Chinese species of the genus, by the blunt leaves with short obtuse acumen and with scattered glands occasionally large enough to be seen with the naked eye, and by the terminal and axillary inflorescences. The flowers are larger and with a few glands similar to those on the

leaves; the cotyledons of the embryo are somewhat concave and the hypocotyl is short, closely resembling that of the Bornean *C. barringtonioides* (Ridl.).

16. **Cleistocalyx leucocladus**, sp. nov. Pl. 215, f. 39–40.

Eugenia subrufa sensu Ridl. Jour. Bot. **68**: 15. 1930, non King.

Glabra; ramis ramulisque albido-cinereis, teretibus; foliis ellipticis, basi late cuneatis, apice obtusis vel brevissime obtuseque acuminatis, 6–10 cm. longis, 3–5.5 cm. latis, coriaceis, olivaceis, crebre puncticulatis, costa supra impressa, subtus elevata, venis primariis gracilibus, patulis, haud perspicuis, utrinque 10–18 inter se 5–9 mm. distantibus, in venam intramarginalem ± 2 mm. a margine distantem confluentibus, secundariis inconspicuis; petiolo crasso, 5–7 mm. longo; inflorescentiis terminalibus et in ramulis annotinis axillaribus, ± 6 cm. longis, pedunculo communi ad 5 cm. longo, ramis ± 1.5 cm. longis, floribus in apice ramulorum ultimorum ternis, sessilibus, alabastris 6 mm. longis, 3.5 mm. diametro; calycis parte superiore sub anthesin calyptratim decidua, staminibus numerosis, antheris minutis.

BORNEO: Sarawak, near Kuching, *Haviland & Hose 3382 A, E, L, M*, holotype at Gray Herbarium, isotypes at Kew, Leiden, and Buitenzorg.

In general habit this species suggests *C. conspersipunctatus* Merr. & Perry of China, but it is readily distinguished by the much shorter and thickish petioles, the broader leaf-base, the smaller flowers and the obtusely angled branches of the inflorescence.

17. **Cleistocalyx paucipunctatus**, nom. nov. Pl. 215, f. 22–23.

Eugenia paucipunctata Merr. Philip. Jour. Sci. Bot. **10**: 215. 1915, non Koord. & Val.

PHILIPPINE ISLANDS: Luzon, Benguet Subprovince, *Merrill (Philip. Pl. 1709)*, distributed as *E. calcicola* Merr.

The habit of this species resembles *Eugenia calcicola* Merr., although technically it clearly belongs to the genus *Cleistocalyx*. The close venation of the leaves, the conspicuous acumen and the compact inflorescence suggest an alliance with the smaller flowered species of the *Acicalyptus* section, but the flowers are not at all angular. The species probably is most nearly related to *C. nigrans* (Gagnep.) but, in the latter, the venation is finer and not only more evenly distributed but also not elevated on the lower surface; the leaves are much more glandular-punctate.

18. **Cleistocalyx nigrans** (Gagnep.), comb. nov. Pl. 215, f. 24.

Eugenia nigrans Gagnep. Not. Syst. **3**: 329. 1917, Fl. Gén. Indo-Chine, **2**: 814. 1920.

COCHIN-CHINA: Caï-cong, Ongien, *Pierre 1934* (type, Herb. Paris).

Doctor F. Gagnepain very generously sent us fragments of a number of his types of *Eugenia*, among others, *E. nigrans* Gagnep. In the original description of this species the calyx is characterized as perfectly truncate, neither lobed nor undulate. This is quite accurate for a full-blown flower, but in the bud of our fragments the apex of the calyx is entirely closed; the latter is the distinctive feature of *Cleistocalyx*.

C. paucipunctatus (Merr.), of the Philippine Islands, is somewhat similar in the size and the shape of the flower-buds as well as in the close venation of the leaves; the latter, however, really differ in outline and in type of venation. The leaves of *C. paucipunctatus* (Merr.) are sub-caudate-acuminate with somewhat unevenly distributed veins; whereas, those of *C. nigrans* (Gagnep.) are acuminate-obtuse with more finely reticulate and more evenly arranged venation.

19. **Cleistocalyx Brongniartii**, nom. nov.

Acicalyptus nitida Brongn. & Gris, Ann. Sci. Nat. V. Bot. **3**: 227. 1865, Bull. Soc. Bot. France, **12**: 186. 1865; Däniker, Vierteljahrssch. Naturf. Gesellsch. Zürich, **78**: Beibl. **19**: 307. 1933.

NEW CALEDONIA: near Balade, *Vieillard 534, 538* (not seen).

The characteristic features of the genus *Cleistocalyx* are well portrayed in the original description of the above species. It is not easy to determine, without material, which are the best specific characters, but possibly they are the very short-petiolate leaves, the congested inflorescences and the perceptibly narrowed (rather than hemispheric) and sulcate calyptras. Brongniart and Gris' specific name is invalid in *Cleistocalyx*.

20. **Cleistocalyx operculatus** (Roxb.), comb. nov. Pl. 215, f. 41–48.

Eugenia operculata Roxb. Hort. Bengal. 37. 1814, *nomen nudum*, Fl. Ind. ed. 2, **2**: 486. 1832; Wight, Ic. **2**(3): 4. *t. 552*. 1843; F.-Vill. Novis. App. Fl. Filip. 85. 1880; Koord. & Val. Meded. Lands Plant. **40**: 148. 1900 (Bijdr. Boomsoort. Java, **6**: 148); Koord. Exkursionsfl. Java, **2**: 679. 1912; Koord.-Schumach. Syst. Verzeichn. Herb. Koord. **1**(1^{222}): 58. 1912; Koord. & Val. Atlas Baumart. Java, **3**: *f. 503*. 1915.

Syzygium nervosum DC. Prodr. **3**: 260. 1828, Mém. Myrt. **2**: *t. 16*. 1842, excluding interpretation of genus p. 41.

Calyptranthes Makal Blanco, Fl. Filip. 419. 1837, non Raeusch.

Calyptranthes Zuzygium Blanco, op. cit. ed. 2, 293. 1845, ed. 3, **2**: 179. 1878, non Sw.

Calyptranthes mangiferifolia Hance ex Walp. Annal. **2**: 629. 1851–52.

Syzygium nodosum Miq. Fl. Ind. Bat. **1**(1): 447. 1855.

Syzygium angkolanum Miq. op. cit. 448.

Eugenia Holtzei F. v. Muell. Australas. Jour. Pharm. June, 1886, Bot. Centralbl. **28**: 148. 1886.

Syzygium operculatum Niedenz. in Engler & Prantl, Nat. Pflanzenfam. **3**(7): 85. 1893; Gamble, Fl. Madras, **1**: 481. 1919.

Eugenia Holtzeana F. v. Muell., Maiden, Dept. Agric. Sydney, N. S. Wales, Misc. Publ. **282**: 22. 1899 (Native Food Plants).

Eugenia clausa C. B. Rob. Philip. Jour. Sci. Bot. **4**: 380. 1909; Merr. Sp. Blanco. 288. 1918, Enum. Philip. Pl. **3**: 162. 1923.

Eugenia divaricato-cymosa Hayata, Icon. Pl. Formos. **3**: 118. 1913.

Eugenia Holteana F. v. Muell., Ewart & Davies, Fl. North. Terr. Austral. 202. 1917.

INDIA: type described from tree, cultivated in Royal Bot. Gard., Calcutta, said to be native of Amboina; copy of original Roxburgh plate ex herb. Calcutta (also reproduced in Wight Ic. t. 552); sketch of leaf, and flower of authentic material of *E. operculata* Roxb. (DeCandolle's Prodromus Herb.); Chittagong Hill Tracts, *King's collector 315;* North Arakan, *Hildebrand 13*: CHINA, Kwangtung, *S. Y. U. 50364, 89693, Wang 9421 (S. Y. U. 67781);* Canton and vicinity, *Levine 1288, 2126, Tsiang 11047;* Honam Island, *Levine 1050;* Lofoushan, *Chun 8297, 40792;* Naam Hoi District, *Levine 3024;* White Cloud Mountain, *Levine 3129;* Weishang, Sunyi District, *Tsiang 2721*, side of stream; Ting Wu Shan, Kao-Yao District, *Tsiang 775, 1496, Liang 60737, Lau 20275;* Ying-Tak, Wentongshan, *Tso 22242;* Shi-wan-da-shan, *Tso 23371;* Hongkong, *Bodinier 613, Wright s. n.;* North Point, *Ford s. n.*, July 29, 1895; Tai-O, New Territory, *Wang 3189;* Ma Au Shan, Shatin, *Tsiang 215;* Upper Aberdeen Road, *Gibbs (Hb. Hongkong 10261);* Kwangsi, Lungchau, *Morse 625;* Hainan, without locality, *Wang 32834, 34169;* Lin Fa Shan, Lam Ko District, *Tsang 166 (L. U. 15665), 343 (L. U. 17092);* Hung Mo Shan, *Tsang & Fung 458 (L. U. 17992);* Dung Ka, *Chun & Tso 43430*, along stream at about 500 m. alt.; Yaichow, *How 70840, 71120, Liang 61996;* Yeung Ling Shan, Ngai District, *Lau 78;* Pak Shik Ling and vicinity, Ching Mai District, *Lei 697, 918;* Tai-too, Seven Finger Mountain, *Liang 61722;* Liamui (Leng Mun), *Gressitt 1165*: INDO-CHINA, Annam, Nghe-An, (*no collector given*) *4*, June 21, 1930; Cochin-China, without locality, *Pierre s. n.*: SUMATRA, Sigamata, near Rantau Parapat, Bila, *Rahmat Si Toroes 3196;* Upper Angkola, *Junghuhn* (Rijks Herb., type of *Syzygium angkolanum*): JAVA, Batavia, Tjitjadas, *v. Steenis 5407;* Preanger, Tjibodas, *v. Woerden 163, 178;* Pengalengan Forest, *Junghuhn* (Rijks Herb., type of *S. nodosum*): BORNEO: British North Borneo, Banguey Island, *Castro & Melegrito 1490;* Mount Kinabalu, Tenompok, *Clemens 28336;* Beaufort, *Bakar (B. N. B. Forestry Dept. 3302);* Dallas, *Clemens 27542, 27562;* Penibukan, *Clemens 30478;* Kiau, *Clemens 10101;* Sarawak, Mount Matang, *Clemens 20959;* Sibu, Rejang River, *Haviland 2845;* Mount Lingga,

Beccari 3943; Dutch Borneo, Pladjoe, *Amdjah 27;* Ben. Dajak, S. Betilap, *van Tuil 10 (Boschproefstation bb: 11607);* Hayoep, *Winkler 2431;* Soengei Landak, *Teysmann 11248, 11250;* Goenoeng Kenepai, *Hallier 1684:* Philippine Islands, Luzon, Ilocos, *Paraiso (For. Bur. 25453);* Rizal Province, *Ramos (For. Bur. 13606),* Antipolo, *Ahern's collector (For. Bur. 470), Merr. Sp. Blancoan. 978, Ramos 314, Ramos & Edano (Bur. Sci. 29527);* Bosoboso, *Merrill 2806;* Palawan, *Danao (For. Bur. 21596):* Australia, Port Darwin, *Holtze.*

Of all the known species of the genus *Cleistocalyx,* this is the commonest, the most widely distributed and perhaps the most misinterpreted. Its habit is generally assumed to be distinctive and certainly the copy of Roxburgh's original plate received through the courtesy of Dr. C. C. Calder, Superintendent of the Royal Botanic Garden, Calcutta, would confirm this idea. In the floral details in Roxburgh's original drawing the first figure (Wight, Icones t. 552, f. 2) shows a calyx with the characteristic calyptra with the corolla inside, explained by Wight as "a flower, petals separating," and the second figure (Wight, Icones t. 552, f. 3) a flower with the petals forcibly opened; this is manifestly schematic. However, there is in India at least one species of like habit with flower-buds similar in outline and such minute calyx-lobes that more than half our collections of these two species are identified as *Eugenia operculata* Roxb. This fact led us to question which was true *E. operculata* Roxb. A bud and a sketch of a half-open flower and a leaf from an authentic *Roxburgh* specimen in the Prodromus Herbarium very kindly supplied us by Professor B. P. G. Hochreutiner, Director of the Botanic Garden, Geneva, confirm the identification of botanists who have accepted Roxburgh's species as having flowers with calyptrate calyces. At the same time it should here be noted that in a number of floras (Benth. Fl. Hongk. 119. 1861; Brandis, For. Fl. 234. 1874; Kurz, For. Fl. Brit. Burma, **1**: 482. 1877; Duthie in Hook. f. Fl. Brit. Ind. **2**: 498. 1879; Trimen, Handbk. Fl. Ceylon, **2**: 179. 1894; King, Jour. As. Soc. Bengal, **70**(2): 129. 1901 (Mater. Fl. Malay. Pen. **3**: 559); Gagnep. in Lecomte, Fl. Gén. Indo-Chine, **2**: 817. 1920; Ridl. Fl. Malay Pen. **1**: 754. 1922) the calyx is described by such phrases as, "truncate," "with short obtuse lobes or nearly truncate," "not distinctly toothed," or "with short obtuse marginate teeth." Even Roxburgh's original description, "Calyx entire; corol operculate," which was followed by de Candolle in the Prodromus, is not too clear. De Candolle, Mém. Myrt. 41. 1842, points out very carefully that the difference between *Calyptranthes* and *Syzygium* is that the former has the operculum formed by the calyx lined by the petals, whereas the latter has the operculum formed by the petals cohering at

the top and the calyx is very short, sometimes truncate, sometimes 5-dentate visible below the operculum of the corolla; yet, op. cit., *t. 16* (*Syzygium nervosum* DC.), which is one of four plates de Candolle used to illustrate the genus *Syzygium,* is practically perfect as to the detail of *Cleistocalyx operculatus* (Roxb.) except that in the younger buds the line of dehiscence between the calyptra and the calyx-tube is *not definitely marked* unless it be assumed from the color. This is an interesting feature of the bud. In dried material, the upper part of the calyx forming the calyptra becomes lighter than the lower part, in fact, much the same color as the corolla in the buds of other species. This may be the explanation of the misinterpretation of the calyx which has been so generally accepted.

Hance ex Walp. Annal. **2**: 629. 1851–52, in his description of *Calyptranthes mangiferifolia* very clearly points out the calyptrate character of the calyx. Hance's description was based on a specimen from Macao, he believing that he had a true *Calyptranthes* introduced by the Portuguese from South America. Koorders & Valeton, Meded. Lands Plant. **40**: 351. 1901 (Bijdr. Boomsoort. Java **6**: 351) give an excellent description, "Calyx in alabastro clausus et saepe apiculatus per anthesin calyptriformi-circumscissus, marginem subintegrum vel pseudo-crenulatum relinquens."

As is to be expected of any wide-ranging species, *Cleistocalyx operculatus* (Roxb.) shows some variation in size of both leaves and flowers, and, since we have not found any constant characters in the material at hand for separating specimens from different regions, we are inclined to believe that a single species is represented.

The type of *Syzygium angkolanum* Miq. is one of the rare instances, in this species ordinarily characterized by lateral inflorescences, where the panicles appear to be axillary and terminal but apparently on leafy shoots of last season, and hence, lateral.

We are unable to maintain *Eugenia Holtzei* F. v. Muell. as a separate species. We strongly suspected this from the description and after examining the fragments of the type generously supplied by Mr. F. J. Rae, Director of the Melbourne Botanic Gardens, we are convinced that here is another collection of the wide-ranging *C. operculatus* (Roxb.).

A Ceylon specimen, *Thwaites, C. P. 2801,* distributed as *Syzygium firmum* Thwaites, Enum. Pl. Zeyl. 116. 1859, with a note, "cf. Enum. pp. 116, 417," in our herbarium seems to be without question *C. operculatus* (Roxb.). It surely does not belong to either of the above species referred to in the Enumeration (*C. P. 2801* is cited under *S. polyanthum,* p. 116, i. e. *Eugenia polyantha* Wight), as we understand them.

21. **Cleistocalyx nicobaricus** (King), comb. nov. Pl. 215, f. 49.

Eugenia nicobarica King, Jour. As. Soc. Bengal, **70**(2): 130. 1901 (Mater. Fl. Malay. Pen. **3**: 560).

Eugenia occlusa sensu Duthie in Hook. f. Fl. Brit. Ind. **1**: 498. 1879; Koord. & Val. Meded. Lands Plant. **40**: 152. 1900 (Bijdr. Boomsoort. Java, **6**: 152); Koord. Exkursionsfl. Java, **2**: 679. 1912; Koord. & Val. Atlas Baumart. Java, **3**: *f. 504*. 1915, non *E. occlusa* Kurz.

NICOBAR ISLANDS: *Kurz* (Herb. Calcutta; fragm.).

That Kurz apparently erred in naming his collection from the Nicobar Islands *Eugenia occlusa* (*Syzygium occlusum* Miq.), seems to be the opinion of botanists who have had access to his collection and to authentic material representing Miquel's species. Such erroneous identification, however, does not alter the fact that, since he based the combination *Eugenia occlusa* on Miquel's earlier name, nomenclaturally it can belong only to the species represented by Miquel's material. Koorders & Valeton likewise erred in applying the name to the species represented by Kurz's collection and in giving a new name to Miquel's species. King noted that Kurz's specimen differed so much from Miquel's description and an authentic specimen of Miquel's species (coll. *Horsfield*) that he gave it a new name.

The Superintendent of the Royal Botanic Gardens, Calcutta, very generously gave permission for Mr. Narayanaswami to send us a fragment of Kurz's collection. The leaf is epunctate and not pellucid-dotted, about 6 cm. long, on either side of the midrib are 7–8 inconspicuous primary veins somewhat arcuately anastomosing to form a submarginal vein about 1 mm. within the margin. The calyx does not appear so tapering toward the base as in *C. operculatus* (Roxb.). There is no evidence that *C. nicobaricus* occurs in Java.

UNIDENTIFIED AND EXCLUDED SPECIES

SYZYGIUM COSTATUM Miq. Fl. Ind. Bat. **1**(1): 451. 1855.

This species is to be excluded from the synonymy of *C. operculatus* (Roxb.). The *Junghuhn* collection, Kupa Manok, Java, very kindly loaned for study by Professor Lam, Rijks Herbarium, is a foliar specimen which, as far as we can tell, is a reasonable match as to leaves and twigs for another collection labeled *S. costatum* by Miquel. The second specimen shows only a young infructescence, at times a difficult stage to interpret in the genus *Cleistocalyx*. However, within the limb of the calyx of one young fruit and apparently a part of the same flower is an evidently operculate corolla. This is a character of *Syzygium*, but in *Cleistocalyx* the corolla does not appear intact after the flower opens

unless associated with the calyptra of the calyx which often adheres to the calyx-tube even after the corolla has fallen.

Syzygium fruticosum DC. Prodr. **3**: 260. 1828, Mém. Myrt. *t. 19.* 1842.

In a note following *Syzygium javanicum* Miquel, Fl. Ind. Bat. **1**(1): 462. 1855, it is suggested that *Syzygium fruticosum* DC. belongs to the section *Symphysion*, op. cit. 460, which, according to our interpretation, is a part of *Cleistocalyx*. Our herbarium material of *S. fruticosum* DC. has a definitely open lobed calyx and hence could not possibly belong in the genus under consideration.

Syzygium javanicum Miq. Fl. Ind. Bat. **1**(1): 461. 1855.

Doctor A. Pulle generously loaned us the type and another specimen labeled *S. javanicum* by Miquel. The latter, we are sure, does not belong to *Cleistocalyx*. The type is very fragmentary, one leaf and a detached inflorescence. The leaf is not a match for any of the species of this group. The flowers except for one shriveled and one maturing bud have all passed anthesis; unfortunately, the one bud which might reveal the distinctive character of the genus is pressed in such a way that it is impossible for us to say without removing it whether or not it is calyptrate. This, we have hesitated to do, hoping that, at some later date, it will be possible to examine a more complete specimen of the type-collection, *Horsfield*, near Soerakarta, Java.

Eugenia nervosa Lour. Fl. Cochinch. **1**: 308. 1790; DC. Prodr. **3**: 284. 1828; Miq. Fl. Ind. Bat. **1**(1): 442. 1855 excl. syn.; Merr. Trans. Am. Philos. Soc. **24**(2): 285. 1935.

Myrtus Loureiri Spreng. Syst. Veg. **2**: 488. 1825.
Cleistocalyx nervosus Blume, Mus. Bot. Lugd.-Bat. **1**: 85. 1849.

If we interpret Loureiro's *Eugenia nervosa*, the basis of *Cleistocalyx nervosus* Blume, by the original description of the calyx, "Cal. superus, 4-partitus, magnus: laciniis, obtusis, concavis," there is no indication that the species belongs either to *Cleistocalyx* as defined by Blume or to the section of *Eugenia* in which it is placed by Miquel. Loureiro's type is not extant.

Syzygium occlusum Miq. Fl. Ind. Bat. **1**(1): 460. 1855.

Eugenia occlusa Kurz, Jour. As. Soc. Bengal, **45**(2): 130. 1876, quoad syn.; Duthie in Hook. f. Fl. Brit. Ind. **2**: 498. 1879, quoad syn., excl. desc.
Eugenia symphysipetala Koord. & Val. Meded. Lands Plant. **40**: 153 (in nota), 161 (descr.). 1900 (Bijdr. Boomsoort. Java, **6**: 153, 161).

Miquel's species was based on *Horsfield 10* from Java. Koorders and

CLEISTOCALYX

Valeton, after examining a fragment of the type in the Utrecht Herbarium, suggest that *Syzygium occlusum* Miq. was based on a mixture of *Eugenia lineata* Duthie and *Eugenia operculata* Roxb. remarking, p. 161, "S[yzygium] species dubia (forsitan e foliis *E. lineatae* cum floribus *E. operculatae* composita)." The specimen of *Horsfield 10* in the Gray Herbarium consists of detached inflorescences of *C. operculatus* (Roxb.) and leafy branches with attached inflorescences of *Eugenia polyantha* Wight. Miquel's species was manifestly based on a mixture of *C. operculatus* (Roxb.) (flowers) and the leaves of *Eugenia lineata* Duthie or *E. polyantha* Wight.

EXPLANATION OF PLATE 215

All fruits and embryos are × 1; the only fruit which we are reasonably sure is mature is that of *C. gustavioides* (F. M. Bailey) picked up under the tree; the embryos except those of *C. Fullageri* (F. v. Muell.) and *C. operculatus* (Roxb.) are shown with the cotyledons as they usually separate when the pericarp is removed.

All buds and flowers are × 2.5; the flowers are in various stages of development to show that the calyptra may or may not remain attached to the calyx-limb.

C. longiflorus: f. 1, fruit; f. 2, bud.
C. Seemanni: f. 3, partly open bud; f. 4, fruit; f. 5, embryo.
C. myrtoides: f. 6, flower (calyptra fallen); f. 7, fruit; f. 8, bud.
C. ellipticus: f. 9, cluster of buds.
C. perspicuinervius: f. 10, cluster of buds; f. 11, very young fruits.
C. retinervius: f. 12, embryo; f. 13, fruit; f. 14, bud; f. 15, flower.
C. arcuatinervius: f. 16, bud; f. 17, fruit; f. 18, flower.
C. nitidus: f. 19, bud; f. 20, flower.
C. Baeuerlenii: f. 21, flower.
C. paucipunctatus: f. 22, bud; f. 23, flower.
C. nigrans: f. 24, bud.
C. barringtonioides: f. 25, fruit; f. 26, embryo; f. 27, flower; f. 28, bud.
C. Fullageri: f. 29, fruit; f. 30, flower; f. 31, immature bud; f. 32, embryo; f. 33, cotyledon (one removed) showing inner face and long hypocotyl.
C. conspersipunctatus: f. 34, bud; f. 35, flower; f. 36, fruit.
C. paradoxus: f. 37, flower; f. 38, bud.
C. leucocladus: f. 39, bud; f. 40, flower.
C. operculatus: f. 41, fruit; f. 42, cross section of embryo; f. 43, embryo; f. 44, bud of *Eugenia Holtzei* F. v. Muell.; f. 45, buds of *Syzygium angkolanum* Miq.; f. 46, bud from Chinese material; f. 47, bud from Javan material; f. 48, flower from authentic collection of Roxburgh in the de Candolle Prodromus Herbarium.
C. nicobaricus: f. 49, flower.
C. gustavioides: f. 50, fruit (remnant of pericarp); f. 51, embryo; f. 52, bud; f. 53, flower.

Arnold Arboretum,
Harvard University.

PHYTOPHTHORA CROWN ROT OF DOGWOOD

D. B. Creager

With plate 216

A disease, which has been responsible for the disfiguration and ultimate death of flowering dogwood trees (*Cornus florida* L.) in various localities on Long Island, New York, was called to the attention of the writer during the summer of 1934. Early observations soon revealed that apparently healthy trees may be attacked and badly damaged within a year or so after becoming infected. Some may be killed in a relatively short time while others may remain alive much longer; however, in either case their ornamental value is soon impaired. In several instances where a diseased tree had been removed and replaced by a healthy one from the nursery or woods, it too became infected and died. Thus far the disease is known to occur only in trees planted on lawns and in gardens; it has not been observed in natural woodland stands.

During the past three years numerous field observations, culture studies and inoculation tests have been made, the results of which demonstrate for the first time the general nature and cause of this disease.

SYMPTOMS

The most obvious symptoms of the crown rot disease of dogwood constitute those associated with a general weakening of the top (Plate 216, Figure 1). The leaves are few, small, light green or chlorotic, usually drooped and their edges rolled. The tips of twigs and branches die, finally involving the larger ones and eventually the entire top. Commonly a severely infected tree bears an abnormal abundance of fruit for several years before it is completely killed.

A more careful examination of such a tree reveals that the seat of the trouble is a characteristic necrotic lesion at the crown; the weakened top is only an indirect expression of the condition of the bark and sapwood of the trunk. At first the lesion is quite obscure and may not be seen without the removal of the outer bark. Eventually, as the extent of the lesion increases, the bark over the older affected parts breaks and sap frequently oozes from the openings in the form of a slime-flux (Plate 216, Figure 2). Such lesions have a marked odor of fermentation and

are attractive to bees and other insects. The bark over the older areas dies, becomes dry and finally falls from the trunk.

Internally the affected tissues of the bark and sapwood are markedly discolored (Plate 216, Figure 3). In older areas the affected tissue is dark brown while at the edge, or more "active" part of the lesion, it is often pinkish, purplish to blue, or light brown and frequently it appears as a streaked variegated zone of all these colors.

When the bark over a typical lesion is removed, the full extent of the affected area is clearly demonstrated. From the level of the soil surface upwards the shape of the lesion is commonly that of a parabola and its surface is characteristically zonate (Plate 216, Figure 3). These zonations apparently represent the progressive advances of the lesion due to alternate favorable and unfavorable periods for growth of the pathogene. The lesion finally involves the greater part of the crown before the tree is eventually killed. Since the typical necrotic lesion at the crown is the seat of the trouble, "crown rot" is proposed for the name of this disease.

THE PATHOGENE

A phycomycetous fungus has been consistently isolated from the characteristic lesions of affected crowns. Tissue plantings made from bark or sapwood of the outer zone of the rotted area commonly yield pure cultures of the fungus. On potato dextrose agar the pathogene grows from such plantings within three days and forms a mat of white, cottony, aërial mycelium.

Based on the works of Tucker (1931), Leonian (1934), and Tompkins, Tucker and Gardner (1936), this fungus has been identified as *Phytophthora cactorum* (L. and C.) Schroet. The mycelium grows rapidly on all ordinary nutrient agar media at room temperature (20° to 25° C.), but on corn meal agar growth was still better at 27.5°C. Oogonia, accompanied by paragynous antheridia, form in great profusion on oat agar in petri dishes within a few days after a new culture is started. The thick-walled oospores are yellowish and average 25.0 microns in diameter with a range of 21.3 to 30.5 microns (500 measurements). Sporangia develop quite abundantly on a synthetic nutrient agar medium prepared from a modified Richard's Solution in which sugar was omitted. They are borne on slender sporangiophores arising from the larger vegetative hyphae; they are ovate, definitely papillate, and average 35.4 by 44.2 microns with a range of 23.2 to 43.5 by 29.0 to 68.1 microns (100 measurements). Two methods of sporangial germination have been observed, namely, by germ tubes and zoospores. In

liquid medium the zoospores are quite active at first; but they soon become quiescent and within a short time germinate by germ tubes. These observations concerning the development and morphology of the various spore forms are similar to those more fully described and illustrated by Rosenbaum (1915) for the same species, *P. cactorum,* isolated from ginseng.

The pathogenicity of this phycomycetous organism was strongly indicated by its consistent association with the typical necrotic lesions at the crown of affected trees. To determine its pathogenicity experimentally, inoculation tests were conducted on plants both in the greenhouse and in the field. For the greenhouse test 35 seedlings of *Cornus florida,* approximately one-quarter of an inch in diameter at the base and 24 to 30 inches in height, were used. All were separately established in pots and were fully in leaf at the time inoculations were made. A wound was made with a sterile scalpel in the stem of each plant at the soil surface by a downward diagonal incision through the bark to the cambium area. Mycelium from an actively growing culture of the suspected pathogene on potato dextrose agar was inserted into the wounds of 25 plants, while sterile potato dextrose agar was placed in the wounds of the remaining 10 plants to serve as checks. A piece of water-saturated absorbent cotton was wrapped about the inoculated wound of each plant and, to retain the moisture, a layer of sphagnum moss was placed over the soil surface of each pot.

Four weeks after the seedlings were inoculated, external symptoms of infection began to appear and at the end of seven weeks 16 of the 25 plants inoculated were dead, while all check plants remained perfectly healthy. The first symptom to appear was a sudden wilting of the foliage. Within a day or so wilting was followed by a drying and browning of all the leaves. When the bark was removed from the basal portion of the stem of such plants, the bark and sapwood above and below the point of inoculation was discolored brown, the discoloration commonly extending into the root bases below and up the stem four to six inches above the soil surface. Not only were the bark and the outer surface of the sapwood discolored, but the discoloration extended through the wood into the pith. The typical phycomycetous hyphae and oogonia were abundantly present in the affected tissues of the bark, wood and pith. The pathogene was consistently reisolated from the discolored wood of these infected seedlings, plantings made from the upper limits of the lesion usually yielding pure cultures of the pathogene.

Similar results were obtained from inoculation tests conducted on larger trees in the field. Typical lesions in the bark and sapwood fol-

lowed inoculations through wounds at the crown, and the pathogene was readily reisolated from all parts of such lesions.

The results of these studies, therefore, demonstrate that the crown rot disease of flowering dogwood is caused by *Phytophthora cactorum* (L. and C.) Schroet. Even though forms of this pathogene have been reported on various members of at least 30 different families of higher plants (Tucker, 1933), apparently this is the first report of its occurrence on *Cornus florida* L. or any other member of the Cornaceae. Nevertheless, *P. cactorum*, as well as several other species of *Phytophthora* are known to cause quite similar diseases in other woody plants, for example, trunk canker of apple (Bains, 1935), crown rot of walnut (Barrett, 1928), crown canker of peach and prune (Smith and Smith, 1925), crown rot of avocado trees (Fawcett, 1916), foot rot and canker of *Citrus* (Fawcett, 1915), Phytophthora canker of *Hevea* (Petch, 1911), and still others. The general nature and symptoms which have been described for these diseases by the various writers are strikingly comparable with those of the crown rot disease of dogwood.

ACKNOWLEDGMENTS

Deep appreciation is expressed to Mr. George Van Yahres for his stimulating cooperation and material aid throughout, to Professor J. H. Faull for helpful advice, and to the Arnold Arboretum and the Biological Laboratories of Harvard University for their laboratory and greenhouse facilities.

LITERATURE CITED

1. Bains, R. C. (1935). Phytophthora trunk canker of apple. (Phytopath. **25**: 5.)
2. Barrett, J. T. (1928). Phytophthora in relation to crown rot of walnut. (Phytopath. **18**: 948–949.)
3. Fawcett, H. S. (1915). The known distribution of Pythiacystis citrophthora and its probable relation to Mal di gomma of Citrus. (Phytopath. **5**: 66–67.)
4. ——— (1916). A Pythiacystis on avocado trees. (Phytopath. **6**: 433–435.)
5. Leonian, L. H. (1934). Identification of Phytophthora species. (West Virginia Agr. Exper. Sta. Bull. **262**: 2–36.)
6. Petch, T. (1911). The physiology and diseases of Hevea brasiliensis, pp. 199–208. (London.)
7. Rosenbaum, J. (1915). Phytophthora disease of ginseng. (Cornell Univ. Agr. Exper. Sta. Bull. **363**: 62–106.)
8. Smith, R. E. and E. H. Smith (1925). Further studies on pythiaceous infection of deciduous fruit trees in California. (Phytopath. **15**: 389–404.)
9. Tompkins, C. M., C. M. Tucker, and M. W. Gardner (1936). Phytophthora root rot of cauliflower. (Jour. Agr. Res. **53**: 685–692.)

10. Tucker, C. M. (1931). Taxonomy of the genus Phytophthora De Bary. (Missouri Agr. Exper. Sta. Res. Bull. **153**: 3–208.)
11. ——— (1933). The distribution of the genus Phytophthora. (Missouri Agr. Exper. Sta. Res. Bull. **184**: 3–80.)

EXPLANATION OF PLATE 216

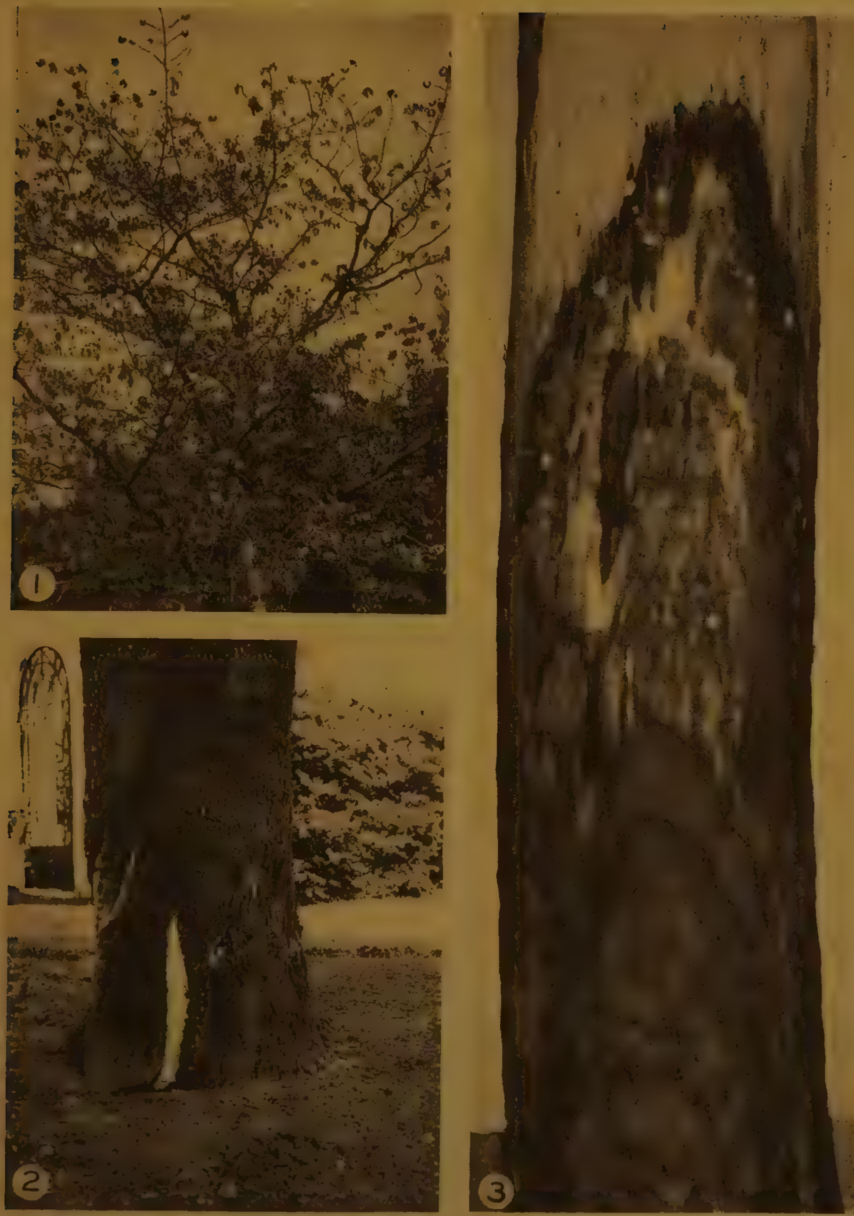
Symptoms of the crown rot disease of dogwood

Fig. 1. A severely infected tree, exhibiting a weakened top with reduced foliage, dying twigs and branches, and an abundance of fruit.

Fig. 2. Trunk of an infected tree (approximately 12 inches in diameter), showing rotted crown; the necrotic lesion had been partially removed at the left, but at the right of the excision the bark over the portion of the lesion which still remains has broken and the sap is exuding in the form of a white, foamy, slime-flux.

Fig. 3. Trunk of an infected tree with bark removed (approximately 6 inches in diameter), exposing the typical, discolored, concentrically zoned lesion in the sapwood.

Laboratory of Plant Pathology,
Arnold Arboretum, Harvard University.



Phytophthora Crown Rot of Dogwood

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1937

WHILE the funded resources of the institution remain as at the close of the previous year, the establishment of the Maria Moors Cabot Foundation for Botanical Research in June, 1937, enables us to amplify our work in certain fields. The initial endowment of this Foundation, the munificent gift of Doctor Godfrey L. Cabot of Boston, is $615,773.00. The income from this fund is allocated to support special investigations in various parts of Harvard University, the Harvard Forest, the Biological Laboratory, the Arnold Arboretum, and the Bussey Institution.

The numerous friends of the Arboretum, scattered all over the United States and Canada have responded generously to its needs. Gifts for cultural purposes up to the end of the fiscal year amounted to about $10,560.00. The appeal this year, the first one made since 1930, was to provide supplementary library funds, to permit the amplification of botanical-horticultural exploration, and to develop a larger nursery on the Walter Street tract. Supplementing these unrestricted gifts, available for immediate use, $6500.00 has been received or promised for special purposes, particularly to cover publication costs. On the basis of what has been received, it is possible to plan a somewhat amplified program during the coming year. We are particularly grateful to the donors of these special small and large gifts, as these funds, being extra-budgetary, enable us to accomplish much-needed investigations, or to undertake needed improvements that it was impossible to finance on the basis of the regular institutional income.

Building and Grounds. — Fortunate in having an unusually mild winter with little or no winter killing of buds, the floral displays at the Arboretum in May and June were unusually attractive. These are the months when the institution is most extensively visited by the public, and within recent years there has been a very noticeable increase in visitors. A careful check of visitors on lilac Sunday, May 23, 1937, indicated an approximate attendance of 40,000 on that one day.

The usual program has been followed in the maintenance of grounds and plantings, involving some thinning and transplanting, the removal of overgrown and moribund plants, and spraying for protection against noxious insects and fungus diseases. Necessary repairs have been made to buildings as required, the most extensive operations being on the

administration building, involving roof and gutter repairs and the pointing up of all masonry construction. A new trellis was constructed for the Wisteria collection.

Horticulture. — In an attempt to make the Arboretum more useful to the community and to the horticulturally minded public in the country at large, considerable progress has been made. Over fifty illustrated lectures were given to various groups on the scope and work of the institution. In the spring, personally conducted tours were arranged for thirty organizations. For use in connection with these lectures, approximately 400 new natural color slides have been prepared, bringing our collection up to about 700. Preliminary work has been done on a series of natural color films, planned to illustrate the attractions of the Arboretum at various seasons. It is anticipated that these will be completed during the coming year.

During the year the hedge demonstration planting was completed, involving plantings averaging 20 feet in length, covering 115 different species. The Wisteria collections were removed from the old site near the Forest Hills entrance, a new trellis was constructed, and all species were replanted near the Bussey Institution building; in close proximity to this planting a collection of 35 named varieties of tree peonies, generously presented by Mr. John Wister, was installed.

The extensive use of fertilizers is being continued, and the response of the treated plantings is noticeable. It is believed that this policy should be consistently followed to compensate, in some degree, for the relatively poor soil characteristic of much of the arboretum area.

The spring plantings involved the actual placing of 521 new plants in various parts of the grounds. In connection with this work the old nursery was entirely rearranged, those shrubs and trees destined for planting in our own grounds being arranged in one area, and the duplicates and material not needed, destined for gifts or exchange purposes, arranged in another section. To take care of urgent additional nursery needs, arrangements have been made to establish a large supplementary nursery on the undeveloped Walter Street tract. New beds were prepared for the willow collection, the Rubus material was removed from the shrub collection to the Peters Hill area, the very badly overgrown Forsythia collection was cut back, this being the only possible way of eliminating a bad fire hazard by the removal of all dead wood.

In an attempt to check the identifications of the very extensive living collections about 500 new labels with changed names were added, and about 400 broken labels were replaced by new ones. Approximately

2000 metal labels, and 2500 wooden display labels were prepared and placed during the year.

Accessions during the year include 2693 living plants received from various sources within the United States and 263 from foreign countries. Cuttings and scions added 193 to this list. Two hundred packets of seeds were received from eighteen foreign countries. Distributions from the Arboretum included 1831 living plants, 980 cuttings and scions, and 772 packets of seeds, to individuals and institutions in the United States and various foreign countries.

The card index list of living plants in the Arboretum has been thoroughly revised, various records eliminated, and others added. There are now approximately 6500 named species and varieties represented in the living collections, an extraordinarily large number when one considers that the institution handles only woody plants, and again when one considers the local climatic limitations. There is still a list of about 1100 additional species that at one time or another have been in cultivation at the Arboretum but which have been lost for one reason or another, that are worthy of re-trial. Arrangements have been made to re-acquire as many of these lost species as possible.

Cooperation has been extended to the Massachusetts Horticultural Society in connection with four exhibits sponsored by that organization. Assistance has been granted to the American joint committee on horticultural nomenclature in the revision of its "Standardized Plant Names." Many data have been supplied to the press on plants and plant problems. Work has been initiated on the much-needed task of revising and completing the detailed base map of the entire Arboretum, showing the exact location of each planted species and variety.

The circulation of the "Bulletin of Popular Information," one of the means whereby horticultural data are made available to the public, has been increased from 612, with 190 paid subscribers early in 1936, to 1500, of which 1200 are actual subscribers.

Plant Pathology. — The extension work of the laboratory of plant pathology has been especially heavy during the past year. This is particularly true with reference to requests for information and help on disease problems. Our interest in the Dutch elm disease situation in the United States has been actively maintained. There are indications that the disease is being controlled and to some extent the infected area being reduced, especially in the State of New York.

Our work on elm diseases at the adjunct field laboratory on Long Island was brought to a conclusion, and an account of the investigation

made there and at the Arboretum by Dr. D. B. Creager is to be published in July as Contribution no. 10 from the Arnold Arboretum.[1] This is a well-rounded piece of research on the cause, means of spread and control of a common, destructive, hitherto little understood, native wilt disease of the American elm caused by a fungus tentatively referred to the genus *Cephalosporium*. It constitutes a fine addition to the literature of elm diseases. Its publication was made possible by generous gifts from Mrs. Harold I. Pratt, Miss Helen C. Frick, Mr. George Van Yahres, and the Massachusetts Society for Promoting Agriculture.

Other significant investigations have been advanced and some publications on them issued. Among these mention should be made of the following: — (1) The physical basis of mycotrophy in *Pinus* by Dr. A. B. Hatch. This is an outstanding piece of work in that it demonstrates the helpful rôle of mycorrhizae in the growth of white pine and it explains that the value of mycorrhizae resides in the ability of the root-associated fungi to collect mineral salts where there is a lack of balance of them in the soil. (2) The control of *Gymnosporangium* rusts by means of sulphur sprays by Drs. J. D. MacLachlan and I. H. Crowell. This represents a valuable, practical conclusion of an admirable series of papers issued from the Arboretum on *Gymnosporangium* rusts harmful to *Juniperus* and various members of the Pomoideae. It is the first practical demonstration of the fact that the disease caused by these fungi can be controlled without having to resort to the radical practice of host eradication. The value of this method has been confirmed by New York State Agricultural Experiment Station and the procedure modified so as, at the same time, to control apple scab. (3) *Chrysomyxa Empetri* — a spruce-infecting rust. This adds another rust to the list known to attack spruces and it rounds out the life-history of a fungus long known only on species of *Empetrum*.

Cytology. — The cytological work during the past year has included two major projects. The first was a study on the effect of temperature on cell division. Extreme temperature changes may cause chromosome division without nuclear division, nuclear division without cell division, and cell division without nuclear division in the microspore development of *Tradescantia*. Chromosome aberrations also were caused by heat treatment.

The effect of temperature changes in causing chromosome division without nuclear division has been used to induce artificial polyploidy. Preliminary work has produced a tetraploid form of *Secale cereale* which

[1]See cover page iii of this number.

is partially self-fertile, and a small population is being grown for experimental purposes. Similar work is being conducted with many of the shrubs in the Arboretum in order to produce polyploid forms of greater hardiness and vigor.

The second cytological project was a study of polyploidy in relation to geographic distribution. A study of the genus *Spiraea* confirms the earlier suggestions that the polyploid forms and species tend to occupy the periphery of the range of distribution. A comparison of diploid and tetraploid races shows a close relationship between chromosome number and cell size in many genera. This effect is reflected in the number of stomata per unit of leaf surface, and stomata counts can be used as a test of polyploidy in closely related forms and species grown under similar conditions. Stomata counts from herbarium material may be of value in indicating the extent of polyploidy in certain genera.

The Herbarium. — During the past fiscal year 24,410 specimens were inserted in the herbarium bringing the total to 454,472 mounted sheets. Of these accessions, 16,300 came from China and 600 from the rest of Eastern Asia, 4300 came from Malaysia, India and Indo-China, 759 from North America, 568 from Central and South America, and 582 from Australia.

Among the more important collections received during the last fiscal year may be mentioned 3337 specimens from Hainan received from the New York Botanic Garden, and an even larger collection from the same Island received from Sun Yatsen University; about 9000 specimens of Japanese plants from the herbarium of Kenzo Shiota representing 3240 species; 2194 specimens from San Domingo collected by Fuertes, received from the Berlin Botanical Museum; 1050 Mexican plants collected by Hinton; about 1000 Sumatran plants received from Prof. H. H. Bartlett, University of Michigan; 734 Australian plants collected by A. Morrison, received from Kew; 612 Mexican plants collected by F. L. Wynd; 602 specimens from the Belgian Congo; 533 Japanese plants collected by Kakuo Uno of Kobe; 335 plants from Greenland and Denmark, received from the Botanical Museum at Copenhagen; 222 plants from East Africa collected by H. J. Schlieben; 450 specimens from Shantung and Anhwei received from the University of Nanking; over 1000 specimens from F. G. Dickason, Rangoon, Burma; and 221 New Guinea plants collected by O. Warburg. Some of this material was acquired by exchange, some by purchase, and some for identification.

The collection of photographic negatives and critical specimens, chiefly Chinese, now amounts to 3513 numbers, 201 having been added during

the fiscal year. An alphabetical list has been prepared and will be sent on application to institutions desiring to exchange or purchase prints.

During the year only about 800 duplicates were distributed, owing to pressure of other work, but a general distribution of duplicate material will take place before the end of 1937. On loan to specialists in this country, Europe and Asia 3911 specimens were sent out.

Besides the constant use of the herbarium by members of the staff of the Arboretum, and also of other departments of the University for special studies, and for the determination of collections, and of plants sent in for identification, the facilities of the herbarium have been used by visitors, among whom may be mentioned: Dr. L. H. Bailey, Ithaca, New York; Professor Rodney True, University of Pennsylvania; Professor Wayne E. Manning, Smith College, Northampton, Mass.; Mr. E. H. Walker, National Herbarium, Washington, D. C.; Dr. G. L. Stebbins, University of California; Professor H. P. Brown, College of Forestry, Syracuse, New York; Dr. A. Gundersen, Brooklyn Botanic Garden; Professor Harold St. John, Honolulu; Dr. Rudolf Florin, Naturhistorisk Riksmuseum, Stockholm; Mr. F. G. Dickason, Judson College, Rangoon, Burma; Professor K. Kominami, Tokyo Imperial University. Dr. Lawrence Ames of the U. S. Department of Agriculture, Washington, is continuing his study of the species of *Berberis* at the Arboretum and their resistance to wheat-rust.

Members of the staff have been engaged in work on special subjects. Dr. E. D. Merrill has continued his work on the floras of Sumatra, Indo-China, and southern China, and in association with Dr. L. M. Perry has undertaken a critical revision of the species of *Eugenia* of China and of Borneo. In association with Miss Florence Freeman material has been assembled for a general revision of the known species of *Microtropis*.

Professor A. Rehder has concluded his study of the ligneous plants described by Léveillé from Eastern Asia and has participated in the identification of collections of Chinese plants. Dr. I. M. Johnston is continuing his studies of Boraginaceae and is actively engaged in identifying a very large and important collection, approximating 5000 numbers, made for the University of California Botanic Garden in Peru, Bolivia, Chile, and Argentina. Dr. C. E. Kobuski has continued his study of the genus *Eurya* and expects to publish the result of his studies before the end of the year. Dr. Caroline K. Allen has pursued her work on the Chinese Lauraceae and will publish a synopsis of the species of *Litsea*, *Neolitsea* and *Actinodaphne* of China and Indo-China before the end of 1937. Dr. H. M. Raup has studied during the summer of last year the ecological conditions of the Black Rock Forest in the Hudson

Highlands of southern New York and has made general collections in that region; these studies are partly incorporated in his paper in the April number of this Journal. Mr. E. J. Palmer is continuing his study of *Crataegus* and has started to make a complete collection of herbarium material of all the trees and shrubs growing in the grounds to aid in a more intensive study of the cultivated forms.

Grants to support botanical exploration of China during 1936 have again been made to the Fan Memorial Institute of Biology in Peiping, and to the Botanical Department of Lingnan University in Canton. In behalf of the former, Dr. H. H. Hu had sent out an expedition under Mr. C. H. Wang to Yunnan; while for the Lingnan University, Prof. F. P. Metcalf had sent an expedition under Mr. W. Y. Tang to Hunan, Kwangtung and adjoining Indo-China. Late in the year a grant was made to Sun Yatsen University, Canton, to enable Prof. W. Y. Chun of that institution to explore certain parts of southern China. In association with the Farlow Herbarium, financial assistance was granted to Prof. B. B. Mundkur to cover the cost of field work in northern India.

The Library. — During the past academic year there have been added to the Library 424 bound volumes, 527 pamphlets and 87 photographs, the total number of accessions now comprising 42,971 bound volumes, 12,003 pamphlets, 17,809 photographs, and 300 unbound volumes. A total of 9,590 cards were distributed in the various indices, and 1,894 slips were filed in the supplement to the author and subject catalogue of the library, making the number of slips now ready for publication 24,699. One hundred and ninety-three volumes have been bound, and one hundred and forty pamphlets put in pamphlet binders. The number of interlibrary loans has been large and 123 photographs have been sold for reproduction in various publications. Visitors registered in the library number 168, including many from foreign countries as well as from all parts of our own country. A short sketch of the Library from its beginning to the present was published in the Bulletin of Popular Information for June 11, 1937.

Atkins Institution of the Arnold Arboretum, Soledad, Cienfuegos, Cuba. — During the summer of 1936 much time and attention was given to the renovation of the plantings injured by the great hurricane of 1935. Badly injured plants had to be severely pruned to remove dead or dying parts and where root damage had resulted from root twisting, tops had to be cut back to give proper balance between roots and tops and to stimulate new growth. The results have been excellent. Much thinning

has been done to permit the development of better specimen plants, and where the same species was represented by scattered specimens, the inferior plants were eliminated.

Scattered representatives of the ferns, lilies, vines, etc. have been assembled in central locations where they can be given better attention, and in the vine section the old wooden supports have been replaced by metal arches. The pipe system has been rearranged with more numerous outlets to facilitate irrigation and watering. The acquisition of a power mower has greatly reduced labor costs in the maintenance of lawns.

In the *seburuco,* an area characterized by native vegetation, grass has been removed to provide places for planting selected native timber trees, the native orchids have been assembled in one place, while the exotic orchids have been assembled in another place. A special area has been cleared for the cactus and succulent garden. East of the *seburuco* the swampy area has been drained in preparation for planting, four acres to the southeast, and an additional twelve acres west of the garden towards Harvard House have been cleared, fenced and partly planted.

The living collections were increased by the addition of 390 species. In exchange 721 packets of seeds, 762 plants (including 173 orchids) and 138 cuttings were received. During the year 1292 packets of seeds were distributed.

Students and investigators at the Atkins Institution during the year included Dr. Lyman Smith and Mr. A. R. Hodgdon of the Gray Herbarium, for the purpose of prosecuting general botanical field work, Mr. O. Tippo, Mr. Charles Heimsch, and Demorest Davenport of the Biological Laboratory, and Mr. Harold A. Senn, of the University of Virginia. Professor J. G. Needham of Cornell University was in residence for several weeks working on the life history of certain dragon flies, and Mr. D. E. Davis spent several months at Soledad working on the life history of the *ani,* a bird having communal nesting habits. The garden was visited in May by Major Johnstone, an English amateur specializing in the study of palms. Professor Thomas Barbour, Custodian, as usual, spent considerable time at Soledad in the early part of 1937, conferring with the resident staff on desirable changes and improvements. A number of other visitors were entertained at Harvard House for shorter periods, chiefly those interested in one type of research or another.

Of particular interest to those who visit Soledad is the fact that the new road from Cienfuegos, passing the Atkins Institution is finished, and on the occasion of its opening the President of Cuba was to attend and visit the Garden.

Publications. — The usual issues of the "Journal" and the "Bulletin of Popular Information" have been issued, but no other special publications have appeared. A number of technical, semitechnical, and popular articles prepared by staff members have been published in extra-institutional serials. Late in the year arrangements were perfected for the very extensive Merrill-Walker "Bibliography of Eastern Asiatic Botany." This extensive work containing approximately 23,000 author entries has been in the course of preparation since 1927. It was to have been published by the Smithsonian Institution, but funds were not available to cover the rather large printing bill. It became possible for the Arboretum to publish this large volume, estimated at 600 pages, quarto, through a generous grant made by the Harvard-Yenching Institute, and a smaller donation from the Smithsonian Institution. These two grants provided slightly in excess of one-third of the amount required, but with this support in hand, an anonymous friend of the Arboretum generously offered to supply the balance required to meet the bill. The volume is expected to be off the press late in 1937 or early in 1938.

Bibliography of the published writings of the staff and students July 1, 1936—June 30, 1937

Creager, D. B. Cephalosporium wilt of elms. (Proc. Nat. Shade Tree Conf. **12**: 140–144. 1936.)

Crowell, I. H. Relative susceptibility of lilac species and varieties to Microsphaera Alni. (U. S. Dept. Agr. Plant Disease Reporter **21**: 134–138. 1937.)

Faull, J. H. Crysomyxa Empetri — a spruce-infecting rust. (Jour. Arnold Arb. **18**: 141–148, *pl. 202–203, fig.* 1937.)

——— Pathological studies on beech at the Arnold Arboretum. (Proc. Nat. Shade Tree Conf. **12**: 21–29. 1936.)

Hunter, L. M. Morphology and ontogeny of the spermogonia of the Melampsoraceae. (Jour. Arnold Arb. **17**: 115–152, *pl. 182–188.* 1936.)

Jack, J. G. Arboreta old and new. (Sci. Monthiy **43**: 541–550. 1936.)

Johnston, I. M. Studies in the Boraginaceae. xii. (Jour. Arnold Arb. **18**: 1–25. 1937.)

Kobuski, C. E. Studies in Theaceae. II. Cleyera. (Jour. Arnold Arb. **18**: 118–129, *pl. 201.* 1937.)

Lott, H. J. An interesting mutation. (Horticulture (Boston), **15**: 192. 1937.)

MacLachlan, J. D. The pimento rust disease. (Jour. Jamaica Agr. Soc. **40**: 277–281. 1936.)

——— & Crowell, I. H. Control of the gymnosporangium rusts by means of sulphur sprays. (Jour. Arnold Arb. **18**: 149–163, *pl. 204.* 1937.)

Merrill, E. D. On the application of the binomial Amaranthus viridis Linnaeus. (Am. Jour. Bot. **23**: 609–612, *fig.* 1936.)

——— The Cabot foundation for botanical research. (Harvard Alumni Bull. **39**: 1018–1021. 1937.)

MERRILL, E. D. The Chinese species described in Meyen's "Observationes botanicae" (Beiträge zur Botanik). (Jour. Arnold Arb. **18**: 54–77. 1937.)
——— Coleus amboinicus. (Addisonia **20**: 11–12, *pl. 646*. 1937.)
——— The identity of Convolvulus reptans Linnaeus. (Philip. Jour. Sci. **59**: 451–453, *pl. 1*. 1936.)
——— On Lactuca indica Linnaeus. (Tokyo Bot. Mag. **51**: 192–196, *pl. 3*. 1937.)
——— Miscellaneous notes on Philippine botany. (Philip. Jour. Sci. **60**: 27–35. 1936.)
——— New names in Timonius. (Jour. Arnold Arb. **18**: 130–132. 1937.)
——— A new Philippine species of Cycas. (Philip. Jour. Sci. **60**: 233–239, *4 pl.* 1936.)
——— Otto Kuntze's new genera and new species of Indo-China plants. (Brittonia **2**: 189–200. 1936.)
——— Palisot de Beauvois as an overlooked American botanist. (Proc. Am. Phil. Soc. **76**: 899–920, *pl.* 1936.)
——— Plants and civilizations. (Sci. Monthly **43**: 430–439. 1936.)
——— Plants and civilizations. (Harvard Tercent. Publ. 22–43. 1937.)
——— Polynesian botanical bibliography, 1773–1935. (Bernice P. Bishop Mus. Bull. **144**: 1–194. 1937.)
——— On the technique of inserting published data in the herbarium. (Jour. Arnold Arb. **18**: 173–182. 1937.)
——— Unrecorded plants from Kwangtung. IV. (Lingnan Sci. Jour. **15**: 415–429, *fig.* 1936.)
——— Aphanomyrtus Miquel and Pseudoeugenia Scortechini. (Blumea, Suppl. **1**: 107–111. 1927.)
——— & METCALF, F. P. New Kwangtung plants. (Lingnan Sci. Jour. **16**: 77–88, *fig. 1–6;* 167–180, *fig. 7–12*. 1937.)
——— & METCALF, F. P. Systematic notes on Hainan plants including new species. I. (Lingnan Sci. Jour. **16**: 181–197, *fig. 1–6*. 1937.)
PALMER, E. J. Benjamin Franklin Bush. (Am. Midland Nat. **18**(3): i-vi, *pl.* 1937.)
——— Benjamin Franklin Bush. (Am. Fern Jour. **27**: 69–71. 1937.)
——— The identification of plant material at the Arnold Arboretum. (Arnold Arb. Bull. Pop. Inf. IV. **5**: 13–16. 1937.)
——— Notes on North American trees and shrubs. (Jour. Arnold Arb. **18**: 133–140, *fig. 1–2*. 1937.)
——— Adventures in fern collecting. II. (Am. Fern Jour. **26**: 136–139. 1936.)
RAUP, H. M. The Chinese collection. (Arnold Arb. Bull. Pop. Inf. IV. **5**: 25–28, *pl. 6*. 1937.)
——— Phyteographic studies in the Athabaska-Great Slave Lake region. (Jour. Arnold Arb. **17**: 180–315, *pl. 190–200, map*. 1936.)
——— Recent changes of climate and vegetation in southern New England and adjacent New York. (Jour. Arnold Arb. **18**: 79–117. 1937.)
REHDER, A. Adolf Engler (1844–1930). (Proc. Am. Acad. Sci. **71**: 497–500. 1937.)
——— On the history of the introduction of woody plants into North America. Trans. from the German by Ethelyn M. Tucker. (Nat. Hort. Mag. **15**: 245–257, *4 fig.* 1936.)
——— A new species of Acer from Guatemala. (Jour. Arnold Arb. **17**: 350–351. 1936.)

REHDER, A. Notes on the ligneous plants described by H. Léveillé from eastern Asia. (Jour. Arnold Arb. **17**: 316–340. 1936; **18**: *26–53*. 1937.)

——— At last a Rhododendron book. [Review.] (Horticulture (Boston), **14**: 59. 1936.)

SAX, K. Effect of variations in temperature on nuclear and cell division in Tradescantia. (Am. Jour. Bot. **24**: *218–225*, *fig.* 1937.)

——— The experimental production of polyploidy. (Jour. Arnold Arb. **17**: 153–159, *pl. 189.* 1936.)

——— Polyploidy and geographic distribution in Spiraea. (Jour. Arnold Arb. **17**: 352–356. 1936.)

——— Chromosome inversions in Paeonia suffruticosa. (Cytol. Fujii Jub. Vol. 108–114, *pl.* 1937.)

——— & HUSTED, L. Polarity and differentiation in microspore development. (Am. Jour. Bot. **23**: 606–609, *fig.* 1936.)

——— & SAX, H. J. Stomata size and distribution in diploid and polyploid plants. (Jour. Arnold Arb. **18**: 164–172, *pl. 205.* 1937.)

TUCKER, E. M. Bibliographical notes. (Jour. Arnold Arb. **18**: 183–184. 1937.)

——— On the history of the introduction of woody plants into North America. By A. Rehder. Trans. from the German by E. M. Tucker. (Nat. Hort. Mag. **15**: *245–257*, *4 fig.* 1936.)

——— The library. (Arnold Arb. Bull. Pop. Inf. IV. **5**: 33–40, *pl. 7–8.*) 1937.

WYMAN, D. Autumn color. (Arnold Arb. Bull. Pop. Inf. IV. **4**: 83–90. 1936.)

——— A few evergreens. (Arnold Arb. Bull. Pop. Inf. IV. **4**: 91–94. 1936.)

——— The forsythias. (Arnold Arb. Bull. Pop. Inf. IV. **5**: 1–8, *pl. 1–2.* 1937.)

——— If "fruiting" shrubs fail to fruit. (Horticulture (Boston), **14**: 408, *fig.* 1936.)

——— Japanese flowering cherries. (Gard. Chron. Am. **41**: 143–144, *4 fig.* 1937.

——— Some of the rarer summer blooming shrubs. (Arnold Arb. Bull. Pop. Inf. IV. **4**: 63–66, *pl.* 1936.)

——— Some single flowering Japanese cherries. (Arnold Arb. Bull. Pop. Inf. IV. **5**: 9–12, *pl. 3.* 1937.)

——— Stewartias in the north. (Gard. Chron. Am. **40**: 262, *fig.* 1936.)

——— Summer blooming vines. (Arnold Arb. Bull. Pop. Inf. IV. **4**: *67–70*, *2 pl.* 1936.)

——— Trends in ornamental plantings. (Am. Nurseryman, **65**(3): *7–8*. 1937.)

——— A trip through the Arboretum during lilac time. (Arnold Arb. Bull. Pop. Inf. IV. **5**: 29–32. 1937.)

——— Two months of azalea bloom. (Arnold Arb. Bull. Pop. Inf. IV. **5**: 17–24, *pl. 4–5.* 1937.)

——— What makes autumn color? (Flor. Exch. **87**(14): 23. 1936.)

——— Woody plants with ornamental fruits. (Arnold Arb. Bull. Pop. Inf. IV. **4**: *71–82*, *2 pl.* 1936.)

E. D. MERRILL, Director.

Staff of the Arnold Arboretum, 1936–37

ELMER D. MERRILL, S.D., LL.D., Professor of Botany, Administrator of Botanical Collections, Director.

JOHN GEORGE JACK, Assistant Professor of Dendrology, Emeritus.

ALFRED REHDER, A.M., Associate Professor of Dendrology and Curator of the Herbarium.

JOSEPH H. FAULL, Ph.D., Professor of Forest Pathology.

IRVING WIDMER BAILEY, S.D., Professor of Plant Anatomy.

KARL SAX, Ph.D., Professor of Botany.

IVAN MURRAY JOHNSTON, Ph.D., Research Associate.

CLARENCE E. KOBUSKI, Ph.D., Assistant Curator of the Herbarium.

HUGH M. RAUP, Ph.D., Research Associate.

DONALD WYMAN, Ph.D., Horticulturist.

CAROLINE K. ALLEN, Ph.D., Assistant in the Herbarium.

ETHELYN MARIA TUCKER, Librarian.

ERNEST J. PALMER, Collector and Research Assistant.

SUSAN DELANO MCKELVEY, Research Assistant.

CONSTANCE M. GILMAN, Business Secretary.

LOUIS VICTOR SCHMITT, Superintendent.

WILLIAM HENRY JUDD, Propagator.

CORRECTIONS

Page 4, line 2, for *pedunculata* read *peduncularis*
" 8, line 8 from below for *pedunculata* read *peduncularis*
" 14, line 4, *for* Grey *read* Gray
" 139, line 14, for **Mahoni** read **Mahloni**
line 16 from below, *for* Mahon *read* Mahlon
" 226, line 1 from below, add — **Synon. nov.**
" 227, line 8 from below, for **14** read **15**
" 229, line 10, for **34** read **15**
line 17, for **coeruleum** read **caeruleum**
" 231, line 17 from below, for *V.* read *P.*
" 234, line 7 from below, *for* (1912) *read* (1914)
" 235, line 20 from below, *before* Léveillé *insert* (Lévl.)
" 237, line 1, *before* (1934) *insert* 312
line 5, *before* (1934) *insert* 310
line 11, *after* l.c. *insert* 311
line 3 from below, *before* 1934 *insert* 315
" 238, line 9 from below, *add* — Woodson in Jour. Arn. Arb. **15**: 312 (1934)
" 244, line 8, after (1917) insert — **Synon. nov.**
line 12 from below, after (1914) insert — **Synon. nov.**
" 245, line 9 from below, after (1912) insert — **Synon. nov.**
" 250, line 12 from below, for **Pampanini** read **Pampaninii**
line 7 from below, for *Pampanini* read *Pampaninii*
" 253, line 12 from below, *for* Léveillé *read* Vaniot
line 5 from below, for *V. araneosa* read *S. araneosa*
" 255, line 12, *before* (1929) *insert* 117
" 257, line 6 from below, for *persicariaefolia* read *persicariifolia*

INDEX

Synonyms are printed in *italics;* new names in **bold-face** type

Acanthopanax *aculeatum*, 71
— trifoliatus, 71
Acer Buergerianum **formosanum**, 216
— *trifidum formosanum*, 216
Acicalyptus, 326
— *elliptica*, 330
— *eugenioides*, 330
— *Fullageri*, 331
— *longiflora*, 329
— *myrtoides*, 329
— *nitida*, 337
— *Seemanni*, 330
Acronychia Esquirolii, 235
Actinidia eriantha, 222
— *lanata*, 222
Adenosma glutinosum, 73
Adenosma grandiflorum, 73
Adina *Fauriei*, 247
— rubella, 247
Aeschynanthus spec., 246
Aganosma cymosa, 237, 361
— Schlechterianum, 238
Aglaia tetrapetala, 210
Akebia Cavaleriei, 256
Alchornea Mairei, 214
Alstonia *Esquirolii*, 235
— Mairei, 235, 276
— *paupera*, 235
— yunnanensis, 235
Alyxia *Bodinieri*, 235
— Schlechteri, 235, 361
Ampelopsis aconitifolia, 220
— cantoniensis, 71
— Chaffanjoni, 220
— Delavayana Gentiliana, 219
Amsinckia intermedia, 22
Andrachne *attenuata*, 212, 257
— *Cavaleriei*, 232
— Esquirolii, 212, 257, 361
— *Millietii*, 232
— *persicariifolia*, 257, 361
Andrews, Henry C. Roses — Bibliographical Notes, 258
Andropogon intermedius Haenkei, 57
Andropogon *Vachellii*, 57
Aneilema *malabaricum*, 66
— *nudicaule*, 66
— nudiflorum, 65
Antiotrema Dunnianum, 25
Antiphytum mexicanum, 16
Antirrhaea Esquirolii, 235
— *Martini*, 238
Apios Martini, 208, 276
Aralia trifoliata, 71
Ardisia crispa, 232
— *Dielsii*, 232
— *Henryi Dielsii*, 232
— *hortorum*, 232
Arduina Carandas, 235
Argyreia Seguini, 242
Aristolochia Blinii, 240
— *Mairei*, 240
— *viridiflora*, 240
— — *occlusa*, 240
Arnebia **Hancockiana**, 21
Arnold Arboretum during the fiscal year ended June 30, 1937, The, 349
Arnold Arboretum, Staff of the, 360
Arundina chinensis, 66
— *Meyenii*, 66
Arundinella setosa, 57
Aspidopterys hypoglauca, 216
Aster *Cavaleriei*, 252
— *Fordii*, 74
— lofouensis, 252
— *lofouensis*, 277
— panduratus, 74
— Walpersianus, 74
Atkins Institution of the Arnold Arboretum, 355
BAILEY, I. W. and MARY R. VESTAL, The orientation of cellulose in the secondary wall of tracheary cells, 185, figs. pl. 206-208
— and MARY R. VESTAL, The significance of certain wood-destroying fungi in the study of the enzymatic hydrolysis of cellulose, 196, figs. pl. 209, 210

BAILEY, I. W. and THOMAS KERR, The structural variability of the secondary wall as revealed by "lignin" residues, 261, pl. 211-214
Bauhinia *chinensis*, 68
— variegata, 68
Benzoin commune, 275
— *glaucum*, 275
— *grandifolium*, 275
— *touyunense*, 275
— — *megaphyllum*, 275
Berghausia barbulata, 58
Bibliographical Notes, 183, 258
Bibliography of the published writings of the staff and students, 357
Bidens Meyeniana, 76
— *tenuifolia*, 76
Bileveillea granulatifolia, 253
Biophytum Esquirolii, 209
— *Reinwardtii*, 209
Bischofia javanica, 213
Blumea *amplectens*, 75
— *chinensis*, 75
— *conyzoides*, 252, 277
— *granulatifolia*, 253
— hieracifolia, 75
— obliqua, 75
— lanceolaria, 253
Bodinierella Cavaleriei, 230
Boea Cavaleriei, 246
Boenninghausenia albiflora, 210
— — brevipes, 210
— *sessilicarpa*, 210
Boraginaceae, XII, Studies in the, 1
Brackenridgea Hookeri, 204, pl. 209, fig. 5, pl. 210, fig. 8, 10, 11
Brandisia racemosa, 245
Bridelia spec., 213
Buddleia *acutifolia*, 234
— — *albiflora*, 276
— Mairei *albiflora*, 276
— officinalis, 234
— — albiflora, 276
— tibetica truncatifolia, 234
— *truncatifolia*, 234
Burretiodendron Esquirolii, 220
Buxus megistophylla, 215
— Myrica, 215
Caeoma Empetri, 145
Callerya tomentosa, 70
Callicarpa Bodinieri, 243
— — Giraldii, 243
— — Lyi, 243
— *Esquirolii*, 243
— *Lyi*, 243
— *Mairei*, 243
— *Martini*, 243
Calyptranthes, 326
— *eugenioides*, 330
— *Makal*, 337
— *mangiferifolia*, 337
— *myrtoides*, 329
— *Seemanni*, 330
— *Zuzygium*, 337
Camellia Costei, 223
— *drupifera*, 223
— Grijsii, 223
— *japonica*, 223
— Mairei, 223
— oleosa, 223
— Pitardii, 223
— — lucidissima, 223
Camptotheca acuminata, 226, 361
Campylotropis polyantha, 276
Canthium Dunnianum, 249
— *Labordei*, 249
Capparis cantoniensis, 257
Capraria crustacea, 73
Carissa Carandas, 235
Carya *aquatica* × *Pecan*, 133
— *cordiformis* × *ovalis*, 135
— Demareei, 135
— texana, 133
Caryopteris *Mairei*, 244, 361
— paniculata, 243
Castanopsis spec., 224
Cayratia oligocarpa, 220
Celastrus euonymoidea, 221
— *Feddei*, 220, 221
Celtis Biondii heterophylla, 255
— *Bungeana heterophylla*, 255
— *Leveillei*, 255
— *polycarpa*, 213
Centrochilus gracilis, 67
Cephalanthus Esquirolii, 226, 361
Ceropegia Balfouriana, 240
Chinese species described in Meyen's "Observationes Botanicae" (Beiträge

zur Botanik), The, 54
Choeradoplectron spiranthes, 67
Chrysanthemum indicum, 253
— — *coreanum*, 253
Chukrasia tabularis, 210
Chrysomyxa Empetri — A spruce-infecting rust, 141
Chrysomyxa Empetri, 145, fig., pl. 202
Cissampelos *hypoglauca*, 68
Cissus cantoniensis, 71
— *diversifolia*, 71
Cladium chinense, 60
— *jamaicense*, 60
— *japonicum*, 60
Clausena Dunniana, 210
— *excavata*, 210
— *Willdenowii*, 210
Cleistocalyx Blume (including Acicalyptus A. Gray), a valid genus of the Myrtaceae, Reinstatement and revision of, 322, pl. 215
Cleistocalyx, 326, pl. 215
— sect. **Acicalyptus**, 326
— sect. **Eucleistocalyx**, 327
— **arcuatinervius**, 333
— **Baeurlenii**, 331
— **barringtonioides**, 332
— **Brongniartii**, 337
— **conspersipunctatus**, 335
— **ellipticus**, 330
— **eugenioides**, 330
— **Fullageri**, 331
— **gustavioides**, 334
— **leucocladus**, 336
— **longiflorus**, 329
— **myrtoides**, 329
— *nervosus*, 342
— **nicobaricus**, 341
— **nigrans**, 336
— **nitidus**, 333
— **operculatus**, 337
— **paradoxus**, 331
— **paucipunctatus**, 336
— **perspicuinervius**, 332
— **retinervius**, 334
— **Seemanni**, 330
— — **punctatus**, 330
Clematis *Finetiana*, 256
— Meyeniana, 67
— Pavoliniana, 256
Clematoclethra spec., 222
Clethra Bodinieri, 228
— Cavaleriei, 228
— kaipoensis, 228
Cleyera, Studies in Theaceae, II, 118
Cleyera, 119
— *albopunctata*, 128
— *elegans*, 128
— *Fortunei*, 123
— *grandiflora*, 125
— *integrifolia*, 128
— japonica, 120
— — *foliis variegatis*, 123
— — **grandiflora**, 125
— — **Hayatai**, 124
— — **lipingensis**, 127
— — **Morii**, 126
— — **parvifolia**, 125
— — **tricolor**, 123
— — *tricolor*, 123
— *Lushia*, 121
— *Lushia Wallichiana*, 121
— *Matsudai*, 128
— *Mertensiana*, 121
— *mexicana*, 128
— *Nimanimae*, 128
— *ochnacea*, 120
— — *grandiflora*, 125
— — *Kaempferiana*, 121
— — *Lushia*, 121
— *ochnoides*, 121
— *serrulata*, 128
— *siphilitica*, 129
— *theoides*, 129
— *Wallichiana*, 121
Climate and vegetation in southern New England and adjacent New York, Recent changes of, 79
Clitoria ternatea, 68
Commelina *cespitosa*, 64
— diffusa, 64
— *longicaulis*, 64
— *nudicaulis*, 66
— *nudiflora*, 64, 66
— *ochreata*, 64
— *pacifica*, 64
— *trichocolea*, 66
Compsoneura capitellata, 204, pl. 209, fig. 3
Control of the Gymnosporangium rusts

by means of sulphur sprays, 149
Conyza *amplexicaulis*, 75
— *Cappa*, 76
— *obliqua*, 75
— *pyrifolia*, 77
— *syringaefolia*, 77
— viscidula, 252, 277
— *volubilis*, 77
Cordia **cordiformis**, 10
— **decipiens**, 11
— **lomatoloba**, 12
— **Mexiana**, 12
Cornus florida, 344
CREAGER, D. B., Phytophthora crown rot of dogwood, 344, pl. 216
Crotalaria albida, 68
— elliptica, 68
— *leiocarpos*, 68
— **Mairei**, 206
— *splendens*, 68
— *Vachellii*, 68
— *spec.*, 211
CROWELL, IVAN H. and J. D. MACLACHLAN, Control of the Gymnosporangium rusts by means of sulphur sprays, 149
Cryptantha **corollata**, 24
— *decipiens corollata*, 24
— **Grahamii**, 23
— **Hooveri**, 23
Cryptolepis Buchanani, 239
Cudrania *Bodinieri*, 257
— tricuspidata, 275
Cyclea *deltoidea*, 68
— hypoglauca, 67
Cymbidium ensifolium, 66
— *Meyenii*, 66
— *micans*, 66
Cynanchum *Boudieri*, 239
— caudatum, 239
— Mooreanum, 239
— *tylophoroideum*, 239
— *yunnanense*, 249
Cynoglossum Cavaleriei, 25
— *Dunnianum*, 25
Cyperus compressus, 61
— *Griffithii*, 61
— *Meyenii*, 61
— radians, 61
— *radicans*, 61
Cyperus *sinensis*, 61
Dalbergia Cavaleriei, 208
Damnacanthus Esquirolii, 235
Daphne *Bodinieri*, 235
— Feddei, 226
— *Martini*, 226
Davidia involucrata, 204, pl. 209, fig. 7
Dendropanax morbiferus, 227
Desmodium *cinerascens*, 207
— Esquirolii, 207
— *formosum*, 69
— *Franchetii*, 207
— heterocarpum, 69
— *nervosum*, 69
— *polycarpum*, 69
— *viride*, 70
Deutzia funebris, 245
Didymocarpus Cavaleriei, 246
Digitalis sinensis, 73
Digitaria dispar, 58
— *heterantha*, 58
Diospyros *Bodinieri*, 215
— Esquirolii, 233
Diploid and polyploid plants, Stomata size and distribution in, 164
Dischidia Esquirolii, 241
— *yunnanensis*, 241
Dogwood, Phytophthora crown rot of, 344, pl. 216
Dolichos trilobus, 209
Duhaldea chinensis, 76
Dumasia *hirsuta*, 208
— villosa, 208, 276
Ecdysanthera rosea, 235
Echium connatum, 21, 250, 276
Edwards's Botanical Register — Bibliographical Notes, 183
Ehretia acuminata, 243
— *Argyi*, 243
Elaeagnus *Argyi*, 226
— *coreanus*, 226
— *crispa coreana*, 226
— — *parvifolia*, 226
— umbellata, 226
Elsholtzia *Bodinieri lavandulaespica*, 244
— heterophylla, 244, 361
— *lavandulaespica*, 244
Embelia *Bodinieri*, 232
— oblongifolia, 232

Embelia *rubrinervis*, 219
Enkianthus *Cavaleriei*, 230
— *cerasiflora*, 230
— chinensis, 230
— Dunnii, 230
— *xanthoxanthus*, 230
Epidendrum ensifolium, 66
Eragrostis cylindrica, 59
— *geniculata*, 59
— *Millettii*, 59
— pilosissima, 59
Erigeron hieracifolium, 75
— *obliquum*, 75
Eriolaena Esquirolii, 220
Eriosema chinense, 69
Erithalis polygama, 131
— *Timon*, 131
Eritrichium brevipes, 6
— *microcarpum*, 8
— *pedunculare*, 8
Erysibe Empetri, 145
Eugenia, 326
Eugenia *arcuatinervia*, 333
— *Baeurlenii*, 332
— *barringtonioides*, 332
— *clausa*, 338
— *cleistocalyx*, 333
— *divaricato-cymosa*, 338
— *gustavioides*, 334
— *Holteana*, 338
— *Holtzeana*, 338
— *Holtzei*, 337
— microphylla, 71
— nervosa, 342
— *nervosa*, 333
— nicobarica, 341
— *nigrans*, 336
— *occlusa*, 341, 342
— *operculata*, 337
— *paradoxa*, 331
— *paucipunctata*, 336
— *perspicuinervia*, 332
— *prora*, 330
— *sinensis*, 71
— *subrufa*, 336
— *symphysipetala*, 342
Euploca racemosa, 19
Eurya § *Cleyera*, 120
— subg. *Cleyera*, 120
Eurya *Esquirolii*, 290
— *latifolia variegata*, 123
— Matsudai, 128, 129
— *ochnacea*, 121
— — *lipingensis*, 127
— — *Morii*, 126
Eurycorymbus *austrosinensis*, 217
— Cavaleriei, 217
Evonymus centidens, 215
— *Thunbergiana oblongifolia*, 215
Fagara Chaffanjoni, 210
— *odorata*, 209
FAULL, J. H., Chrysomyxa Empetri — A spruce-infecting rust, 141, fig., pl. 202, 203
Ferula marathrophylla, 72
Ficus *corymbifera*, 245
— Esquirolii, 256
— foveolata, 255
— *hirtaeformis*, 222
— Martini, 256
— *Ouangliense*, 211
— *rufipes*, 248, 255
— Vanioti, 256
— *Vanioti*, 211
Fimbristylis *decora*, 62
— podocarpa, 62
— sericea, 62
— subbispicata, 61
Fraxinus *Fauriei*, 217
— mandshurica, 195, pl. 208, fig. 14
Freziera elegans, 128
— integrifolia, 128
— Nimanimae, 128
— *ochnacea*, 121
— theoides, 129
— sp., 128
Fusarium Caries, 56
Garnotia barbulata, 58
Gerardia glutinosa, 73
Gilibertia morbifera, 227
Glossogyne tenuifolia, 76
Glycine Soja, 208
— *ussuriensis*, 208
Gongronema yunnanense, 242
Gordonia axillaris, 224
Grewia *biloba*, 221
— *Esquirolii*, 221
— Feddei, 220

Grewia *glabrescens*, 221
— Henryi, 221
— *parviflora glabrescens*, 221
— *spec.*, 221
Gymnosporangium rusts by means of sulphur sprays, Control of the, 149
Habenaria *acuifera*, 66
— *endothrix*, 67
— *lacertifera*, 67
— linguella, 66
— Meyenii, 67
Hackelia brachytuba, 25
— *Dielsii*, 25
Handeliodendron Bodinieri, 217
Hedera hypoglauca, 71
Hedyotis Esquirolii, 247
— *hedyotidea*, 247
Hedysarum heterocarpon, 69
— *lutescens*, 70
— *polycarpon*, 69
— *sericeum*, 70
Heliotropium *americanum*, 17
— angustifolium, 18
— anomalum mediale, 21
— calcicola, 16
— convolvulaceum racemosum, 19
— coriaceum, 15
— dichroum, 18
— *Eggersii*, 17
— eremogenum, 20
— fallax, 14
— — Hintonii, 15
— *inundatum*, 17
— — *cubense*, 17
— Jaffuelii, 19
— *petraeum*, 17
— procumbens, 17
— *pueblense*, 17
— *rigidulum*, 17
— Sessei, 13, 361
— uninerve, 18
Henreyettana mirabilis, 25
Herbarium, On the technique of inserting published data in the, 173
Heterostemma Esquirolii, 242
Hoya *carnosa*, 241
— *Esquirolii*, 241
— Lyi, 241
Hoyopsis Dielsii, 241
Hypericum *Bodinieri*, 225
— *Dielsii*, 224
— erectum, 224
— — *axillare*, 224
— *Matsumurae*, 224
— napaulense, 225
— otaruense, 224
— *Vanioti*, 224
Ilex macrocarpa, 215
— purpurea, 215
Illigera Dunniana, 256
Incarvillea Argyi, 242
Index to Notes on the ligneous plants described by H. Léveillé from Eastern Asia, 278
Indigofera *chinensis*, 70
— Esquirolii, 207
Inula Cappa, 76
— indica hypoleuca, 277
— *pseudo-cappa*, 76
Iodes ovalis, 276
Iryanthera macrophylla, 204, pl. 209, fig. 4
Ischaemum aristatum lodiculare, 59
— — Meyenianum, 59
Ixora Henryi, 248
Jambosa nitida, 333
Jasminum Prainii, 234
— Seguini, 233
JOHNSTON, IVAN M., Studies in the Boraginaceae, XII, 1
KERR, THOMAS, and I. W. BAILEY, The structural variability of the secondary wall as revealed by "lignin" residues, 261, pl. 211-214
Keteleeria Davidiana, 254
— *Esquirolii*, 254
KOBUSKI, CLARENCE E. Studies in Theaceae. II, Cleyera, 118, pl. 201
Lappula Dielsii, 25
Larix occidentalis, 195, 271, pl. 207, fig. 5, 7, 8, pl. 214, fig. 14
Lasianthus Hartii, 249
— *Labordei*, 249
Laurelia aromatica, 204, pl. 209, fig. 6, pl. 210, fig. 9
Lepiaglaia ? tetrapetala, 210
Lepidosperma chinense, 62
Lespedeza *dichromocalyx*, 276

Lespedeza *dichromoxylon*, 276
— fasciculiflora, 207
— formosa, 69
— *Monnoyeri*, 208
— sericea, 69
— *viatorum*, 69
Lettsomia Seguini, 242
Leucothoë Griffithiana, 230
— *spec.*, 230
Léveillé, Notes on the ligneous plants described by H. . . . from Eastern Asia, 26, 206, 273
Lignin residues, The structural variability of the secondary wall as revealed by, 261, pl. 211-214
Lindera *Bodinieri*, 275
— communis, 275
— glauca, 275
— megaphylla, 275
— — touyunensis, 275
— *yunnanensis*, 275
— *spec.*, 213
Lindernia crustacea, 73
Lithocarpus edulis, 195, pl. 208, fig. 12
Lithodora Hancockiana, 21
Lithospermum *albiflorum*, 21
— *Hancockianum*, 21
— *Komarovianum*, 22
— *Mairei*, 21
— officinale, 21
Litsaea Esquirolii, 275
Litsea *Cavaleriei*, 275
— Kobuskiana, 290
— *touyunensis*, 275
Lonicera Pampaninii, 250, 361
Lophopetalum spec., 271, pl. 213, fig. 9
Lycopodium *amentigerum*, 57
— cernuum, 57
Lyonia ovalifolia, 230
— — lanceolata, 231
— villosa pubescens, 231
Lysimachia capillipes Cavaleriei, 232
— *Mairei*, 222
— Millietii, 232
Lysionotus *Cavaleriei*, 246
— pauciflorus linearis, 246
Macaranga Esquirolii, 214
MacLachlan, J. D. and Ivan H. Crowell, Control of the Gymnosporangium rusts by means of sulphur sprays, 149, pl. 204
Maesa scandens, 237
Mallotus Esquirolii, 213
Mariscus chinensis, 60
Marquartia tomentosa, 70
Marsdenia *Cavaleriei*, 242
— oreophila, 242
— stenantha, 241
— tenacissima, 242
— *yunnanensis*, 242
Meibomia viridis, 70
Melampsoropsis Empetri, 145
Melica latifolia, 60
Meliosma cuneifolia, 218
— Oldhamii, 217
Melodinus *Bodinieri*, 237
— *Cavaleriei*, 236, 237
— *Chaffanjoni*, 237
— *Dunnii*, 237
— Hemsleyanus, 234, 361
— *khasianus*, 234
— Seguini, 235
Melodium Dunnii, 237
Meoschium lodiculare, 59
— *Meyenianum*, 59
Merrill, E. D., The Chinese species described in Meyen's "Observationes Botanicae" (Beiträge zur Botanik), 54
— New names in Timonius, 130
— On the technique of inserting published data in the herbarium, 173
— and L. M. Perry, Reinstatement and revision of Cleistocalyx Blume (including Acicalyptus A. Gray), a valid genus of the Myrtaceae, 322, pl. 215
Mespilus Esquirolii, 222
Metaplexis Cavaleriei, 242
Meyen's "Observationes Botanicae" (Beiträge zur Botanik), The Chinese species described in, 54
Microglossa albescens, 252
— pyrifolia, 77
— *volubilis*, 77
Microtoena *Esquirolii*, 244
— insuavis, 244
— *mollis*, 244
Microtropis fokienensis, 216
Milletia *Esquirolii*, 207

Milletia nitida, 70
Miquelia barbulata, 58
Mitrasacme *chinensis*, 72
— nudicaulis, 72
Mitreola pedicellata, 10
Moquinia eriosematoides, 76
Morinda Esquirolii, 214
Morus integrifolia, 275
Mucuna Birdwoodiana, 208
— *Bodinieri*, 208
Mussaenda Esquirolii, 248
Myodocarpus simplicifolius, 195, pl. 208, fig. 10, 11
Myosotis mexicana, 14
— *microcarpa*, 8
— *peduncularis*, 8
Myrsine Chaffanjoni, 216
Myrtus Loureiri, 342
Nelitris Timon, 131
Neolitsea spec., 290
New names in Timonius, 130
North American trees and shrubs, Notes on, 133, figs.
Notes on the ligneous plants described by H. Léveillé from Eastern Asia, 26, 206, 273
Notes on North American trees and shrubs, 133, 2 figs.
Oldenlandia corymbosa, 73
— hedyotidea, 247
— *macrostemon*, 247
Omphalodes Bodinieri, 10
— *Cavaleriei*, 6
— *cordata*, 5
— *Esquirolii*, 6
— *Mairei*, 4
— *moupinensis*, 5
— *sericea*, 25
— *Vaniotii*, 6
Onosmodium dodrantale, 22
Ophiorrhiza Esquirolii, 234
Orientation of cellulose in the secondary wall of tracheary cells, The, 185, pl. 206-208, 3 figs.
Osteophloeum platyspermum, 205, pl. 210, fig. 13
Paederia *Bodinieri*, 249
— Cavaleriei, 249
— *Dunniana*, 249
Paederia *Esquirolii*, 249
— *Mairei*, 249
— *Rehderiana*, 249
— scandens, 249
— *tomentosa purpureo-coerulea*, 249
— *Wallichii*, 249
— yunnanensis, 249
PALMER, ERNEST J., Notes on North American trees and shrubs, 133, 2 figs.
Panax aculeatum, 71
Panicum acariferum, 60
— *commutatum*, 58
— *heteranthum*, 58
Paracaryum brachytubum, 25
Paradombeya sinensis, 222
Parameria Esquirolii, 238
Paspalum heteranthum, 58
Passiflora *cupiformis*, 225
— Seguini, 225
Pentace Esquirolii, 220
Pentasacme Esquirolii, 242
Periploca astacus, 237
Peristylus chloranthus, 67
PERRY, L. M. and E. D. MERRILL, Reinstatement and revision of Cleistocalyx Blume (including Acicalyptus A. Gray), a valid genus of the Myrtaceae, 322, pl. 215
Phyllagathis Cavaleriei, 227, 361
Phyllanthus Bodinieri, 212
— *spec.*, 212
Phytophthora cactorum, 345
Phytophthora crown rot of dogwood, 344, pl. 216
Pieris Cavaleriei, 230
— *Duclouxii*, 231
— *Henryi*, 231
— *kouyangensis*, 231
— *longicornu*, 231
— *Mairei*, 231
— — *parvifolia*, 231
— *repens*, 231
— *Ulbrichii*, 230
Pinus longifolia, 195, 272, pl. 208, fig. 9, pl. 214, fig. 15, 16
— rigida serotina, 205, pl. 210, fig. 12
— Strobus, 195, pl. 206, fig. 4
Piptanthus spec., 211
Pirus brunnea, 275

Poa cylindrica, 59
Podocarpus Mairei, 254
Pogonatherum paniceum, 60
— *refractum*, 60
— *saccharoideum*, 60
Pogostemon lavandulaespica, 244, 361
Polygala arillata, 211
— Dunniana, 211
— japonica, 211
— *Taquetii*, 211
Polyphragmon sericeum, 131
Populus adenopoda, 273
— Bonatii, 273
— *rotundifolia macranthela*, 273
Poraqueiba sericea, 204, 271, pl. 209, fig. 1, pl. 212, fig. 3-7
Premna *Bodinieri*, 243
— *Mairei*, 218
— puberula, 243
Prismatomeris **Labordei**, 249
Psychotria Henryi, 248
— Prainii, 248
Pteris ensiformis, 57
Pterostigma grandiflorum, 73
— *rubiginosum*, 73
Pterostyrax *hispidus*, 233
— Leveillei, 233
Pueraria *caerulea*, 276
— *coerulea*, 276
— Thomsoni, 209
— Thunbergiana, 208, 276
— *triloba*, 208
Pycnospora lutescens, 70
Quamoclit pennata, 242
Quercus *annulata*, 138
— *bicolor* × Q. *lyrata*, 140
— breviloba, 138
— *breviloba* × Q. *stellata*, 139
— *coreana*, 274
— glandulifera, 274
— **humidicola**, 140
— **Mahloni**, 139, 361
— Nuttallii, 136, fig. 1
— — **cachensis**, 136, fig. 2
— *prinoides* × Q. *stellata*, 139
— *serrata*, 274
— **stelloides**, 139
Ramalina digitata, 56
— *geniculata*, 56
Raup, Hugh M., Recent changes of climate and vegetation in southern New England and adjacent New York, 79
Recent changes of climate and vegetation in southern New England and adjacent New York, 79
Rehder, Alfred, Index to Notes on the ligneous plants described by H. Léveillé from Eastern Asia, 278
— Notes on the ligneous plants described by H. Léveillé from Eastern Asia, 26, 206, 273
Reinstatement and revision of Cleistocalyx Blume (including Acicalyptus A. Gray), a valid genus of the Myrtaceae, 322, pl. 215
Rhabdothamnopsis chinensis, 246
— *sinensis*, 246
Rhamnella Martini, 219
— rubrinervis, 219
Rhamnus Bodinieri, 219
— *Cavaleriei*, 219
— Esquirolii, 219
— Leveilleanus, 219
— *Martini*, 219
Rhizophora Mangle, 271, pl. 211, fig. 1
Rhynchosia Argyi, 208
Rhynchospora chinensis, 62
Rhododendron Bachii, 229
— caeruleum, 229, 361
— chrysocalyx, 230
— denudatum, 229
— Duclouxii, 229
— Esquirolii, 229
— irroratum, 229, 361
— *kouytchense*, 230
— *Maximowiczianum*, 229, 361
— rex, 229
— *spinuliferum*, 229
— *Vaniotii*, 229
Rosa acicularis, 257
— *Argyi*, 257
— cymosa, 257
— *korsakoviensis*, 257
— lucidissima, 257
— Marrettii, 257
— *microcarpa*, 257
Rubus adenochlamys, 49
— alceaefolius, 32

Rubus alnifoliolatus, 41
— *ampelophyllus*, 39
— amphidasys, 35
— *ampliflorus*, 30
— *andropogon*, 33
— *arbor*, 28
— *Argyi*, 44
— *asper*, 43
— — *grandifoliolatus*, 43
— — *myriadenus*, 43
— Blinii, 37
— *Bodinieri*, 37
— *Bonatii*, 48
— *Boudieri*, 49
— Buergeri, 37
— calycacanthus, 31
— — *Buergerifolia*, 31
— *Cavaleriei*, 34
— *Chaffanjoni*, 35
— chroosepalus, 28
— *clinocephalus*, 33
— corchorifolius, 37
— coreanus, 46
— — *Nakaianus*, 46
— crataegifolius, 38
— — itoensis, 39
— — Makinoensis, 39
— — *minor*, 39
— — *subcrataegifolius*, 40
— croceacanthus, 42
— *Darrisii*, 31
— *defensus*, 27
— Delavayi, 41
— *diamantinus*, 52
— *Duclouxii*, 41
— *eous*, 50
— *erectifolius*, 39
— Esquirolii, 34
— *euleucus*, 50
— *fasciculatus*, 50
— Fauriei, 38
— Feddei, 35
— *fimbriiferus*, 32
— foliolosus, 48
— fragarioides adenophora, 26
— *Franchetianus*, 26
— Gentilianus, 29
— *Grossularia*, 40
— hastifolius, 36
Rubus *hirsutus*, 44
— — *Argyi*, 44
— *Hoatiensis*, 47
— holadenus, 31
— ichangensis, 29
— idaeus aculeatissimus, 53
— — diamantinus, 52
— — Matsumuranus, 52
— — *microphyllus*, 52
— — *sachalinensis*, 53
— — *strigosus*, 52
— — Yabei, 51
— ikenoensis, 27
— illudens, 48
— incisus, 40
— — *geifolius*, 40
— — *Koehneanus*, 41
— — **subcrataegifolius**, 40
— innominatus Kuntzeanus, 49
— irenaeus, 36
— *itoensis*, 39
— *Jamini*, 36
— *japonicus*, 26
— kanayamensis, 51
— *kerriifolius*, 38
— *Kinashii*, 50
— — *coreensis*, 49
— *Koehneanus*, 41
— *Kuntzeanus*, 49
— — *xanthacantha*, 49
— *Labbei*, 31
— Lambertianus minimiflorus, 30
— — *paykouangensis*, 30
— *lasiocarpus micranthus*, 45
— *longistylus* 49
— Lyi, 35
— Mairei, 28
— *Mairei*, 48
— *Makinoensis*, 39
— malifolius, 28
— *mallodes*, 33
— marmoratus, 42
— *Matsumuranus*, 52
— *melanolasius discolor*, 53
— mesogaeus, 50
— micranthus, 45
— *minimiflorus*, 30
— minusculus, 41
— *Mongouilloni*, 32

Rubus *Mouyousensis*, 28
— multibracteatus, 33
— — *Demangei*, 32
— *myriadenus*, 43
— — *grandifoliolatus*, 43
— *Nakaianus*, 47
— *nipponicus*, 51
— *ouensanensis*, 40
— *Papyrus*, 29
— parvifolius, 47
— paykouangensis, 30
— *petaloideus*, 28
— pinfaensis, 50
— pseudo-japonicus, 26
— — *diversifolius*, 26
— *pseudosaxatilis*, 46
— — *Kouytchensis*, 46
— *Pyi*, 45
— *quelpaertensis*, 46
— refractus, 27
— Rocheri, 27
— *rosaefolius minor*, 42
— — *sumatranus*, 43
— *sachalinensis*, 53
— schizostylus, 48
— setchuenensis, 34
— sino-Sudrei, 36
— *stephanandria*, 44
— *strigosus*, 52, 53
— — *kanayamensis*, 51
— *subcrataegifolius*, 41
— *suberectifolius*, 39
— *succedaneus*, 42
— sumatranus, 43
— *talaikiaensis*, 44
— *Taquetii*, 47
— tephrodes ampliflorus, 30
— Thunbergii, 44
— — *Argyi*, 44
— — *R. Argyi*, 44
— — *talaikiensis*, 44
— — *R. talaikiensis*, 44
— tongchouanensis, 45
— *triflorus diversifolius*, 26
— *triphyllus*, 47
— — *Taquetii*, 47
— *Vanioti*, 38
— *Wrightii ampelophyllus*, 39
— — *makinoensis*, 39
Rubus *Wrightii ouensanensis*, 40
— *xanthacantha*, 49
— *Yabei*, 51
Saccharum paniceum, 60
Sakakia, 120
— *Hayatai*, 124
— *longicarpa*, 127
— *Matsudai*, 129
— *Morii*, 126
— *ochnacea*, 121
Salix amygdalina nipponica, 273
— andropogon, 225, 361
— angiolepis, 255
— *anisandra*, 254
— *Argyi*, 254
— Blinii, 274
— *Camusii*, 254
— *caprea*, 273
— Cavaleriei, 254
— dodecandra, 254
— *Duclouxii*, 255
— — *kouytchensis*, 255
— erioclada, 255
— *Feddei*, 273
— *funebris*, 255
— Gilgiana, 274
— *gymnolepis*, 274
— hallaisanensis, 273
— — *nervosa*, 274
— *Kinashii*, 273
— koreensis, 273
— *kouytchensis*, 255
— luctuosa, 255
— *Mairei*, 255
— *Makinoana*, 274
— *pachyclada*, 255
— *pogonandra*, 273
— *polyandra*, 254
— *pseudo-Gilgiana*, 273
— *pseudo-jessoensis*, 273
— *pseudo-lasiogyne*, 273
— *purpurea gymnolepis*, 274
— *Pyi*, 254
— *Taquetii*, 274
— *triandra discolor*, 273
— variegata, 255
— Wallichiana, 255
— Wilsonii, 254
— *yunnanensis*, 254

Sarcopyramis *Bodinieri*, 227
— napalensis, 227
— *nepalensis Bodinieri*, 227
SAX, HALLY JOLIVETTE and KARL SAX, Stomata size and distribution in diploid and polyploid plants, 164, pl. 205
SAX, KARL and HALLY JOLIVETTE SAX, Stomata size and distribution in diploid and polyploid plants, 164, pl. 205
Schistocodon Meyenii, 72
Scleria *pratensis*, 63
— pterota, 63
Scoparia gypsophiloides, 73
Secondary wall as revealed by "lignin" residues, The structural variability of the, 261, pl. 211-214
Secondary wall of tracheary cells, The orientation of cellulose in the, 185, pl. 206-208, figs.
Senecio *araneosus*, 253
— *Gentilianus*, 254
— Hoi, 277
— saxatilis, 253
— spelaeicola, 277
— Walkeri, 253, 361
— *Walkeri*, 277
— *yalungensis*, 277
Sequoia sempervirens, 194, pl. 206, 208, figs. 1-3, 13
Sideroxylon Bodinieri, 217
Significance of certain wood-destroying fungi in the study of the enzymatic hydrolysis of cellulose, The, 196, pl. 209, 210, figs.
Sindechites *Esquirolii*, 238
— Henryi, 238
Siparuna bifida, 271, pl. 213, fig. 8, 10-13
Solanum Capsicastrum, 245
— cornutum, 245, 361
— *Dunnianum*, 245
— *Heudesii*, 245, 361
— verbascifolium, 245
Sophora spec., 207
Spruce-infecting rust — Chrysomyxa Empetri, A, 141, pl. 202, 203
Staff of the Arnold Arboretum, 360
Stauntonia obovata, 256
Stemonurus secundiflorus, 204, pl. 209, fig. 2
Stephanotis yunnanensis, 242
Sterculia Bodinieri, 212
Stomata size and distribution in diploid and polyploid plants, 164
Strobilanthes lofouensis, 247
Structural variability of the secondary wall as revealed by "lignin" residues, The, 261, pl. 211-214
Strychnos Esquirolii, 218
Studies in the Boraginaceae, XII, 1
Studies in Theaceae. II, Cleyera, 118
Styrax Argyi, 233
— *Bodinieri*, 233
— *Cavaleriei*, 233
— grandiflorus, 233
— japonicus, 233
— *touchanensis*, 233
Syllysium buxifolium, 71
Symphitum fruticosum, 16
Symplocos *coronigera*, 233
— *Courtoisii*, 215
— Ernesti, 233
Syzygium sect. *Symphysion*, 326
— *angkolanum*, 337
— *buxifolium*, 71
— costatum, 341
— *firmum*, 340
— fruticosum, 342
— javanicum, 342
— *nervosum*, 337
— *nodosum*, 337
— occlusum, 342
— *operculatum*, 338
Tarenna incerta, 248
Technique of inserting published data in the herbarium, On the, 173
Tephrosia vestita, 71
Ternstroemia albopunctata, 128
— *japonica*, 120
— *Lushia*, 121
— sp., 128, 129
Tetramerista glabra, 271, pl. 211, fig. 1
Tetrastigma obtectum, 219
Teucrium palmatum, 244, 361
Textoria morbifera, 228
Thea Camellia lucidissima, 223
— *Cavaleriana*, 223
— *Costei*, 223
— *Grijsii*, 223

Thea Mairei, 223
— *oleosa*, 223
— *Pitardii*, 223
— — *lucidissima*, 223
— *podogyna*, 223
— *sinensis androxantha*, 223
Theaceae, Studies in, II, Cleyera, 118
Thecopsora Empetri, 145
Thysanolaena *acarifera*, 60
— *Agrostis*, 60
— maxima, 60
— *procera*, 60
Timonius, New names in, 130
Timonius, 131
— *ferrugineus*, 132
— *hirsutus*, 132
— *involucratus*, 132
— octonervius, 132
— papuanus, 132
— Ridleyi, 132
— *Rumphii*, 131
— *sericeus*, 131
— Timon, 131
Toxocarpus Wightianus, 72
Trachelospermum axillare, 237, 361
— Bodinieri, 237, 361
— *Cavaleriei*, 239
— Dunnii, 237, 361
— *Esquirolii*, 234, 361
— gracilipes, 236
— — *Cavaleriei*, 236
— *Navillei*, 238
— *rubrinerve*, 236, 237
Tradescantia malabarica, 66
Tragia *involucrata*, 214
— Mairei, 214
Trigonotis, 1
— *Bodinieri*, 10
— brevipes, 6
— Cavaleriei, 6
— compressa, 4
— *contortipes*, 10
— delicatula, 10
— *Faberi*, 6
— gracilipes, 9
— heliotropifolia, 9
— macrophylla, 4
— — trichocarpa, 4
— — verrucosa, 4
Trigonotis Mairei, 4
— microcarpa, 7
— mollis, 7
— moupinensis, 5
— *muriculata*, 4
— omeiensis, 6
— peduncularis, 8
— — *macrophylla*, 4, 361
— — *microcarpa*, 8
— — *vestita*, 8, 361
— Rockii, 10
— rotundata, 7
— sericea, 25
— vestita, 8
Triosteum himalayanum, 21, 250, 276
Tristylium, 120
— *ochnaceum*, 121
— — *Morii*, 126
Trochodendron aralioides, 195, pl. 207, fig. 6
Trypterygium hypoglaucum, 216
TUCKER, ETHELYN M., Bibliographical Notes, 183, 258
Tylophora *Argyi*, 239, 240
— *Cavaleriei*, 239
— Dielsii, 241
— floribunda, 240
— *Hoyopsis*, 241
— Leveilleana, 240
— spec. ?, 241
Uredo Empetri, 145
Urena *diversifolia*, 71
— lobata, 71
Utricularia racemosa, 73
Vaccinium *Donianum*, 231
— Duclouxii, 231
— fragile myrtifolium, 231
— *Mairei*, 231
— *mandarinorum*, 231, 361
— mandarinorum austrosinense, 231, 361
— *repens*, 231
Vandellia crustacea, 73
— *limosa*, 73
Vanieria Bodinieri, 257
— *tricuspidata*, 275
Vernonia arbor, 277
— *arbor*, 251
— arborea, 250, 276
— *congesta*, 76

Vernonia *eriosematoides*, 76
— *Esquirolii*, 251, 253, 277, 361
— extensa, 252, 277
— *Gomphrena*, 75
— *Leveillei*, 251
— *Martini*, 251, 277
— papillosa, 251
— *papillosa*, 277
— saligna, 251, 277
— *Seguini*, 251, 277
— *spelaeicola*, 253, 277
— *subarborea*, 252, 277
— *Vanioti*, 250, 276
— volkameriaefolia, 251, 276
Vestal, Mary R. and I. W. Bailey, The orientation of cellulose in the secondary wall of tracheary cells, 185, pl. 206-208, figs.
— and I. W. Bailey, The significance of certain wood-destroying fungi in the study of the enzymatic hydrolysis of cellulose, 196, pl. 209, 210, figs.
Viburnum *ajugifolium*, 250
— Cavaleriei, 250
— *foetidum*, 250
— foetidum ceanothoides, 250
— *Valbrayi*, 250
Vitis cantoniensis, 71
— *Chaffanjoni*, 220
— *Gentiliana*, 219
— *heterophylla aconitifolia*, 220
Vitis oligocarpa, 220
— *Potentilla glabra*, 219
— *Seguini*, 276
Wallich, Nathaniel. Tentamen florae napalensis illustratae. — Bibliographical notes, 260
Webera Cavaleriei, 248
— *Henryi*, 248
— *pallida*, 248
Wendlandia *Dunniana*, 247
— uvariifolia Dunniana, 247
Wikstroemia Bodinieri, 235, 361
— *Hemsleyana*, 235
Wisteria dubia, 68
Wood-destroying fungi in the study of the enzymatic hydrolysis of cellulose, The significance of certain, 196, pl. 209, 210, figs.
Wrightia Schlechteri, 238, 361
— *spec.*, 239
Xolisma ovalifolia, 231
— — *lanceolata*, 231
— *villosa pubescens*, 231
Zanthoxylum Chaffanjoni, 210
— *myriacanthum*, 209
— *odoratum*, 209
— rhetsoides, 209
— *trifoliatum*, 71
Zenobia cerasiflora, 230
Zizyphus pubinervis, 218